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TRANSCRIPT OF RECORD.

SUPREME COURT OF THE UNITED STATES.

OCTOBER TERM, 1902.

No. 148.

KOKOMO FENCE MACHINE COMPANY

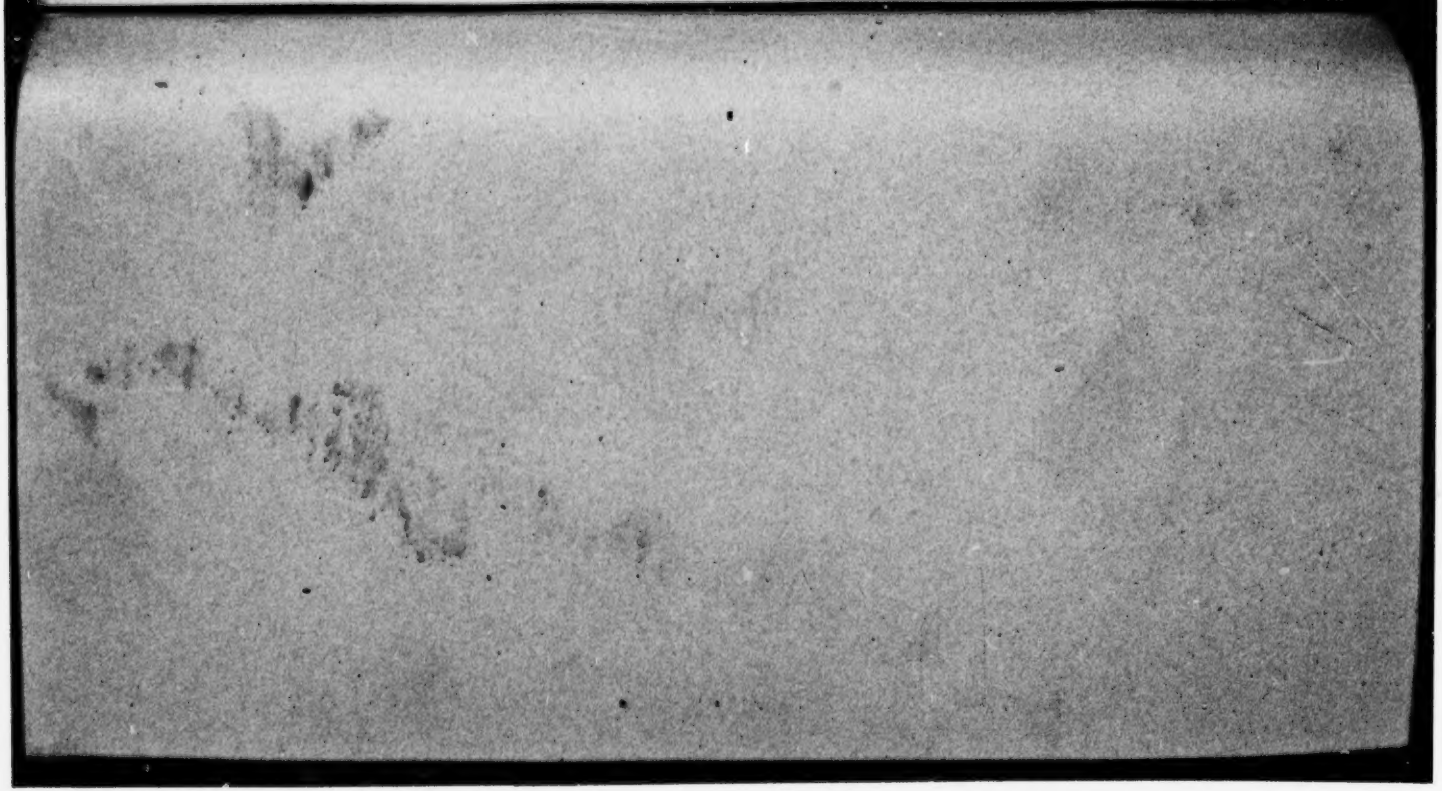
vs.

ALVA L. KITSELMAN AND DAVIS M. KITSELMAN.

WRIT AND CROSS-WRIT OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SEVENTH CIRCUIT.

PETITION FOR WRIT OF CERTIORARI FILED AUGUST 5, 1901.
CERTIORARI AND RETURN FILED DECEMBER 9, 1901.
PETITION FOR CROSS-WRIT FILED MARCH 6, 1902.
CROSS-WRIT GRANTED MARCH 17, 1902.

(18,242.)



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a *Transcript of Record.*

In the United States Circuit Court of Appeals for the Seventh Circuit, October Term, A. D. 1899.

ALVA L. KITSELMAN and DAVIS M. KITSELMAN, Appellants,
vs.
KOKOMO FENCE MACHINE COMPANY, JESSE H. SROFE, Harry Ward, John E. Frederick, Kittie Srofe, George W. Frederick, and Joel Ward, Appellees. } No. 647.

Appeal from the circuit court of the United States for the district of Indiana.

Mr. Robert H. Parkinson, counsel for appellant-.
Mr. Thomas A. Banning, Mr. Ephraim Banning, Mr. Charles W. Miller, Mr. James S. Drake, counsel for appellees.

Transcript of record filed November 24, 1899.
Printed record filed Jan. 30, 1900.

EDWARD M. HOLLOWAY, *Clerk.*

1 & 2 *Pleas.*

Pleas of the circuit court of the United States for the district of Indiana, begun and holden at the United States court-house in the city of Indianapolis, in said district, on the first Tuesday in May, in the year of our Lord one thousand eight hundred and ninety-nine, before Honorable John H. Baker, judge of the district court of the United States for the district of Indiana and *ex officio* judge of said circuit court.

ALVA L. KITSELMAN and DAVID M. KITSELMAN
vs.
KOKOMO FENCE MACHINE COMPANY, JESSE H. SROFE, Harry Ward, John E. Frederick, Kittie Srofe, George W. Frederick, and Joel Ward. } No. 9574. Chancery.

Be it remembered that heretofore, to wit, at the November term of said court, on the 15th day of March, 1898, before Honorable John H. Baker, judge of said court, the following proceedings in the above-entitled cause were had, to wit:

Come now the complainants by Robert H. Parkinson, Esq., their solicitor, and file their bill of complaint herein, in the words following, to wit:

Bill of Complaint.

Filed March 15, 1898.

3 United States Circuit Court, District of Indiana.

ALVA L. KITSELMAN and DAVIS M. KITSELMAN, Copartners as Kitselman Bros., *vs.* KOKOMO FENCE MACHINE CO., JESSE H. SROFE, HARRY WARD, JOHN E. FREDERICK, KITTIE SROFE, GEORGE W. FREDERICK, JOEL WARD.	In Equity.	No. 9574.

Bill of complaint.

To the honorable judges of said court:

Alva L. Kitselman and Davis M. Kitselman, copartners as Kitselman Bros., of Ridgeville, Indiana, and citizens of said State of Indiana, bring this their bill of complaint against Kokomo Fence Machine Co., a corporation duly organized under the laws of Indiana, and domiciled and having its principal place of business in Kokomo, in said State, and inhabitant and citizen of said State, Harry Ward, Jesse H. Srofe, Kittie Srofe, John E. Frederick, residing at said Kokomo, and George W. Frederick and Joel Ward, residing at Ridgeville, in said State, all citizens of said State of Indiana, formerly carrying on the business complained of as partners under the name of Kokomo Fence Machine Co., at said Kokomo, and now carrying on the same business at the same place under the same name as an incorporated company under the laws of the State of Indiana.

And thereupon your orators complain and say:

That heretofore and before the 13th day of August, 1886, Alva L. Kitselman, then and now a citizen of the United States, one of your orators, became and was, as your orators now verily believe, the original and first inventor of a certain new and useful improvement in wire-fabric machines, not known or used before his invention thereof, and not in public use nor on sale in the United States
4 for more than two years prior to his application for letters patent therefor, and not before patented or described in any printed publication in this or any foreign country; and that he thereupon applied to the Commissioner of Patents of the United States for letters patent therefor, in manner and form as by statute required, and by an instrument in writing duly executed, delivered and recorded, assigned one undivided third interest in said invention and application and any part that should issue thereupon to Davis M. Kitselman, of said Ridgeville, one of your orators; and that thereafter upon due proceedings had on said application, letters patent of the United States, duly signed, countersigned and sealed, were issued thereon and delivered unto your orators, two-thirds interest being thereby granted to said Alva L. Kitselman and one-

third to said Davis M. Kitselman, which letters patent were dated the 19th day of January, 1887, and are numbered 356,322, thereby granting unto your orators herein, and their heirs, legal representative and assigns, for the term of seventeen years thereafter, the full and exclusive right and privilege of constructing, using and vending to others to be used, the said invention as described and claimed in the schedule annexed to and forming a part of said letters patent, which said letters patent, numbered 356,322, or a certified copy thereof, complainants will produce as your honors shall direct, and a copy of which is herewith filed, marked "Complainants' Exhibit Kitse-man Patent."

Your orator further shows unto your honors, that heretofore, and before the 23rd day of October, 1886, Theodore M. Conner, of Richmond, Indiana, a citizen of the United States, became and was, as your orators now verily believe, the original and first inventor of a certain other new and useful improvement in wire-fabric machines not known or used before his invention thereof and not in public use or on sale in the United States for more than two years prior to his application for letters patent therefor and not before patented or described in any printed publication in this or any foreign country, and that he thereupon applied to the Commissioner of Patents of the United States for letters patent therefor, in manner and form as by statute required, and by instrument in writing duly executed, delivered and recorded, assigned an undivided part of said invention and application and any patent that should issue thereon, to Thompson M. Conner and John B. Dougan, of said Richmond, Indiana, and that thereafter upon due proceedings had, letters patent of the United States, duly signed, countersigned and sealed, were issued thereon and delivered to said Theodore M. Conner, Thompson M. Conner and John B. Dougan, dated February 1, 1887, and numbered 357,067, thereby granting to said Theodore M. Conner, Thompson M. Conner and John B. Dougan, their heirs, legal representatives and assigns, for the term of seventeen years thereafter, the full and exclusive right and privilege of constructing, using and vending to others to be used the said invention as described and claimed in the schedule annexed to and forming part of said letters patent, which said letters patent numbered 357,067, or a duly authenticated copy thereof, complainants will produce, as your honors shall direct, and a copy of which is herewith filed, marked "Complainants' Exhibit Conner Patent."

Your orators further show unto your honors that thereafter, on or about the 28th day of March, 1887, by a duly drawn, executed, delivered and recorded instrument in writing, all the right, title and interest in and to said letters patent numbered 357,067, and the invention and improvements thereby secured, became vested in your orators, as by said assignment, or a duly authenticated copy thereof ready in court to be produced, if required, will more fully and at large appear.

Your orators further show unto your honors that heretofore and before the 8th day of September, 1883, William J. Davisson, of Farmland, Indiana, a citizen of the United States, became and was, as

your orator- verily believes, the original and first inventor of a certain new and useful improvement in wire-fabric machines, not known or used before his invention thereof, and not in public use or on sale in the United States for more than two years prior to his application for letters patent therefor, and not before patented or described in any printed publication in this or any foreign country, and that he thereupon applied unto the Commissioner of Patents of the United States for letters patent therefor, in manner and form as by statute required, and by instrument in writing duly executed, delivered and recorded, conveyed one undivided half interest in said invention and any patent that should issue therefor to Jonathan A. Botkin, of Swain's Hill, Indiana; that thereafter proceedings were had on said application, and letters patent of the United States,
6 duly signed, countersigned and sealed, were issued thereon and delivered for the said invention to said Davisson, and said Botkin as assignee of said one-half interest, which letters patent are dated the 4th day of December, 1883, and are numbered 289,507, thereby granting to said Davisson and Botkin, their heirs, legal representatives and assigns, for the term of seventeen years thereafter, the full and exclusive right and privilege of constructing, using, and vending to others to be used, the said invention as described and claimed in the schedule annexed to and forming a part of said letters patent, which said letters patent, numbered 289,507, or a certified copy thereof, complainants will produce as your honors shall direct, and a copy of which is herewith filed, marked "Complainents' Exhibit Davisson Patent."

Your orators further show unto your honors that thereafter, and on or about the 12th day of May, 1896, by duly drawn, executed, delivered and recorded instruments in writing, all the right, title and interest in and to said letters patent numbered 289,507, and the invention and improvements thereby secured, became vested in your orators, as by said assignment, or duly authenticated copies thereof, in court to be produced, if required, will more fully and at large appear.

Your orators further show unto your honors, that heretofore, and before the 2nd day of May, 1893, John C. Pope, of Fox, Illinois, a citizen of the United States, became and was, as your orators verily believe, the original and first inventor of a certain other new and useful improvement in wire-fabric machines, not known or used before his invention thereof and not in public use or on sale in the United States for more than two years prior to his application for letters patent therefor, and not before patented or described in any printed publication in this or any foreign country, and that he thereupon applied to the Commissioner of Patents of the United States for letters patent thereon in manner and form as by statute required, and by instrument in writing duly executed, delivered and recorded, assigned said invention and application and any patent that should issue thereon to your orators, the said Alva L. Kitselman and Davis M. Kitselman, and that thereafter, upon due proceedings had, letters patent of the United States, duly signed, countersigned and sealed, were issued thereon and delivered unto your orators, dated

September 26, 1893 and numbered 505,607, thereby granting
7 unto your orators, their heirs, legal representatives and assigns, for the term of seventeen years thereafter, the full and exclusive right and privilege of constructing, using, and vending to others to be used, the said invention as described and claimed in the schedule annexed to and forming a part of said letters patent, which said letters patent numbered 505,607, or a duly authenticated copy thereof, are ready here in court to be produced, as your honors shall direct, and a copy of which is herewith filed, marked "Complainants' Exhibit Pope Patent."

Your orators further show unto your honors, that the several inventions described, shown and claimed in the said letters patent numbered, respectively, 356,322, 357,067, 289,507 and 505,607 are capable of conjoint use in the same machine for making twisted wire fabric for use as fencing, and are so embodied and used conjointly in the same machine for said purpose by the said defendants in the infringement hereinafter complained of, as well as by your orators in the machines now and heretofore manufactured by them under the aforesaid letters patent.

Your orators further show unto your honors that at or about the date of the grant of the first-mentioned letters patent, to wit, about the 1st of January, 1887, your orators engaged extensively, at Ridgeville, Indiana, in the manufacture, use and sale of wire-fabric machines built under and in accordance with said letters patent, and during the same year of machines embodying also the inventions of the said Davisson and the said Conner patents, and subsequently, about the date of the said Pope patent, introducing and thereafter embodying therein the inventions embraced in said Pope patent, ever since the first-mentioned date devoting much time and expense to introducing to the public, manufacturing and selling and bringing into use wire-fabric machines embodying said inventions and making the same useful to the public; that they ever since have been and still are extensively engaged in manufacturing, advertising, introducing, bringing into use and vending the said machines embodying said inventions under said letters patent and have during each year, including and since 1887, made and sold a large number of said machines, having been throughout the exclusive manufacturers thereof until the infringement of these defendants hereinafter complained of, (except one instance where an
8 infringement being started your orators brought suit, and said infringement was promptly discontinued, and one other where infringement being started your orators gave notice of their rights, and the said infringement was thereupon discontinued); that they have retained throughout the ownership and exclusive control of said letters patent, and each of them, except that they have granted in certain localities rights to sell and use said inventions under some of said letters patent (such grants, however, not including the territory in which the above-mentioned defendants have been and are carrying on the infringement hereinafter complained of, in which said territory your orators hold exclusive right under said letters patent in all respects); that said machines

so manufactured and sold by your orators have gone into very extensive use throughout this country and in other countries; that your orators' exclusive rights in respect to the same, as secured by said letters patent, have been generally acquiesced in and respected by the public; that your orators have made extensive preparation for supplying the trade therewith and large investments for said purpose, and now are and have been throughout the period of the infringement hereinafter complained of, prepared to supply the entire demand therefor throughout this country and in other countries where the same have been introduced.

Your orators further show unto your honors, that they have given sufficient notice to the public that their said machines which embody the said inventions were patented by affixing upon all said machines manufactured, used or sold by them under authority of said letters patent, the word "Patented," and the date of the said Kitselman patent from the time they commenced to manufacture the same, and subsequently adding thereto the dates of each of the other said patents, and that they have promptly upon learning of said infringement, notified said defendants, in writing, that they were infringing said letters patent, to wit, on or about July 14, 1896, and requested them to desist therefrom, but they have disregarded said notice, and thereafter continued said infringement.

Your orators further show unto your honors, that said several inventions have been and are of great advantage to the public and to your orators and that your orators will realize and receive large gains and profits therefrom if the infringement by said defendants and their confederates be prevented, and, on the other hand, will suffer great and irreparable loss and damage if said infringement be not prevented.

9 Yet the said defendants, well knowing the premises and the exclusive rights secured to your orators, as aforesaid, but confederating together and conspiring and contriving to injure your orators and to deprive them of the benefits, advantages and rights which might and otherwise would accrue unto them under and by reason of said letters patent, before the commencement of this suit and after the grant of said letters patent, respectively, and the assignment to your orators of the exclusive rights and titles thereunder, did, as your orators are informed and believe, to wit, at Kokomo, Indiana, and elsewhere in the United States, without the license or allowance and against the will of your orators and in violation of their rights and in infringement of the said letters patent, wilfully, unlawfully and wrongfully combine and confederate together to appropriate unto themselves the said inventions, and to infringe upon the said several letters patent, by manufacturing at said Kokomo, Indiana, and selling and putting into use there and elsewhere in the United States, wire-fabric machines copied after your orators' aforesaid machines and embodying in all said machines the inventions embraced and secured in and under said letter patent, respectively; that the said Jesse H. Srofe having been for some years prior to 1896 employed by your orators as a salesman in the introduction and sale of their said machines embodying said inventions and hav-

ing been made familiar thereby with the said machines and with the trade supplied by your orators and with the fact that said machines were manufactured under said letters patent owned and controlled by them, started, at said Kokomo in the year 1896, the business of building and selling said infringing machines, in confederation with said Harry Ward (who had, prior to said year 1896, been associated in business with your orators in the office where they were then carrying on the aforesaid business and had been personally familiar with the said machines as manufactured and sold by them and with the fact that they were manufactured and sold under letters patent owned and controlled by your orators), and the said Kittie Srofe, Joel Ward, John E. Frederick and George W. Frederick (each of whom were personally acquainted with your orators' aforesaid machines and with the fact that they were manufacturing the same under letters patent owned and controlled by them), the said Jesse H. Srofe, Harry Ward, Kittie Srofe, Joel Ward, John E. Frederick and George W. Frederick engaging together at said Kokomo in the manufacturing, advertising and selling of said infringing machines embodying said inventions conjointly, first as partners under the name of Kokomo Fence Machine Co., and thereafter obtaining articles of incorporation under the same name, the said corporation continuing the same business at the same place and succeeding in all respects to the business of said firm, the entire stock therein being taken and owned by the aforesaid partners, and the said Jesse H. Srofe becoming and ever since remaining and now being the president thereof and the said Harry Ward vice-president thereof and the said John E. Frederick secretary and treasurer thereof; and your orators are credibly informed and believe and charge that said incorporation was primarily obtained and entered into by said defendants for the purpose of carrying on this infringement and distributing the profits accruing therefrom among the said stockholders and avoiding personal liabilities therefor; that said corporation has no substantial or visible or valuable assets sufficient to satisfy a judgment herein or to afford your orators any adequate remedy in a recovery of damages or profits sustained by reason of said infringement; that said company is incorporated for a trivial amount; that the profits of said infringement are being distributed among the stockholders as they accrue and that all said stockholders are personally cognizant of the rights of your orators as herein set forth and of the infringement thereof thus being carried on, and entered into said corporation with such knowledge for the express purpose of confederating together in such infringement and carrying on the manufacture and sale of the aforesaid infringing machines and avoiding personal responsibility therefor.

Your orators further shows unto your honors, that the manufacture, sale and use of said infringing machines and the said infringement upon your orators' exclusive rights under said letters patent is a constant menace to the business of your orators and incites and encourages others to set at defiance their said rights and infringe upon said letters patent.

Your orators further show unto your honors, upon information and belief, that said defendants have made and realized large benefits and advantage from said infringement, but to what extent exactly your orators do not know and pray discovery thereof;
11 that the said defendants, though requested to desist therefrom continued to set your orators' rights at defiance and to manufacture and sell said infringing machines, as aforesaid, and threaten to continue so to do; that the said infringement by the said defendants and their avowed determination to continue the same and their other unlawful acts in disregard and defiance of the rights of your orators, are causing, and threaten to continue to cause, your orators great and irreparable damage and to deprive them of large profits which lawfully belong to them under said letters patent and would accrue to them but for said infringement, and that the amount in controversy exceeds fifty thousand dollars ($50,000.00), exclusive of costs and interest.

Forasmuch, therefore, as your orators are without adequate remedy except in this court, to the end that the said defendants may, if they can, show why your orators should not have the relief prayed, and may make full and true answer and discovery in respect to all matters hereinbefore set forth, and may be compelled to account for and pay over to your orators the gains, profits, advantages and income derived from the said infringement and from any and all violations of the rights of your orators in the premises, and may be restrained from any further violation of said rights, your orators pray that your honors may grant a writ of injunction, both provisionally and perpetually restraining the defendants from the further construction, use or sale of said infringing machines, or any part thereof, and from all infringements upon said letters patent, and that the infringing machines now in their possession may be destroyed or delivered up to your orators for that purpose, and that your honors, upon the entering of a decree for infringement, as above prayed for, may assess, or cause to be assessed under your direction, in addition to the profits, gains and savings to be accounted for by the defendants, as aforesaid, the damages your orators have sustained by reason of said infringement, and that your honors may increase the actual damages so assessed to a sum equal to three times the amount of such assessment, by reason of the unjust and wilful infringement by said defendants, as herein set forth, and may further award your orators their costs in this cause most wrongfully sustained, and execution therefor; and may further grant to your orators a provisional or preliminary injunction, and such other relief as the equity of the case may require and as to your honors may seem
12 meet.

May it please your honors to grant unto your *honors* a writ of injunction conformable to the prayer of this bill, and also a writ of subpœna of the United States of America directed to the said Kokomo Fence Machine Co., Jesse H. Srofe, Harry Ward, John E. Frederick, Kittie Srofe, George W. Frederick and Joel Ward, commanding them to appear and answer unto this bill of complaint and to abide and perform such order and decree in the premises as to

the court shall seem meet and be required by the principles of equity and good conscience.

ALVA L. KITSELMAN.
DAVIS M. KITSELMAN,
By ALVA L. KITSELMAN.

STATE OF ILLINOIS, } ss:
County of Cook, }

On this 8th day of March, 1898, before me personally appeared Alva L. Kitselman, one of the above-named complainants, and signed said bill of complaint in my presence, and being by me duly sworn, deposes and says that he has read the foregoing bill of complaint subscribed by him and knows the contents thereof and is acquainted with the facts therein set forth, and that the same are true to the best of his knowledge, information and belief.

ALVA L. KITSELMAN.

Sworn to and subscribed before me on the day and year above written.

(Signed) CHARLES L. HINE,
[NOTARIAL SEAL.] *Notary Public, Cook County, Illinois.*

13 & 14 And afterwards, to wit, at the November term of said court, on the 28th day of April, 1898, before Honorable John H. Baker, judge of said court, the following further proceedings in the above-entitled cause were had, to wit:

Come now the defendants by Blacklidge & Shirley, Baker & Miller, and Banning & Banning, their solicitors, and file their answer herein, in the words following, to wit:

Answer.

Filed April 28, 1898.

15 Circuit Court of the United States, District of Indiana.

ALVA L. KITSELMAN and DAVIS M. KITSELMAN, Co-partners, etc., Complainants,
vs.
KOKOMO FENCE MACHINE CO., JESSE H. SROFE, Harry Ward, John E. Frederick, Kittie Srofe, George W. Frederick, and Joel Ward, Defendants. } In Equity.

The joint and several answer of The Kokomo Fence Machine Company, Jesse H. Srofe, Harry Ward, John E. Frederick, Kittie Srofe, George W. Frederick, and Joel Ward, defendants, to the bill of complaint of Alva L. Kitselman and Davis M. Kitselman, copartners, etc., complainants.

These defendants, now and at all times hereafter saving and reserving unto themselves all and all manner of benefit and advantage of exception that may be had or taken to the many errors,

insufficiencies and inaccuracies in the said bill of complaint contained, for answer thereunto or unto so much and such parts thereof as these defendants are advised it may be necessary to answer unto, answering say:

As to whether the complainants are copartners doing business under the firm name of Kitselman Bros., these defendants neither admit nor deny the allegations of the bill, but leave the complainants to make such proof thereof as they may consider advisable or necessary.

These defendants further answering, admit that the defendant company, The Kokomo Fence Machine Company, is a corporation duly organized and existing under and by virtue of the laws of the State of Indiana and having its principal office and place of business at Kokomo in said State, and that the other defendants are inhabitants and citizens of said State of Indiana; but these defendants deny that before the organization and incorporation of said company they, as individuals, were engaged in carrying on the same business as that carried on by said company under the name of said company, or otherwise.

These defendants, further answering, say that as to whether one Alva L. Kitselman was the original and first inventor of certain alleged new and useful improvements in wire-fabric machines,
16 and as to whether such alleged inventions or improvements were not known or used before his alleged invention thereof, and as to whether said alleged inventions were not in public use or on sale in the United States for more than two years prior to his application for letters patent of the United States therefor, and as to whether said alleged inventions or improvements were not patented or described in any printed publication in the United States or any foreign country, and as to whether he applied for letters patent of the United States in manner and form as required by the statute, and as to whether by an instrument in writing, duly executed, delivered and recorded, he assigned an undivided one-third interest in said alleged inventions or improvements and application, and any patent that might be issued thereon, to Davis M. Kitselman, these defendants have no information, save from the allegations of the bill of complaint in that particular, and so neither admit nor deny said allegations, but leave the complainants to make such proof thereof as they may be advised is material or necessary; but these defendants admit that letters patent of the United States No. 356,322 were, on the 19th day of January, 1887, issued to the said complainants.

These defendants, further answering, say that as to whether one Theodore M. Connor was the original and first inventor of certain other alleged new and useful improvements in wire-fabric machines, and as to whether such alleged inventions or improvements were not known or used before his invention thereof, and as to whether such alleged inventions or improvements were not in public use or on sale in the United States for more than two years prior to his application for letters patent therefor, and as to whether such alleged inventions or improvements

were not patented or described in any printed publication in this or any foreign country, and as to whether he applied for letters patent therefor in manner and form as required by the statute, and as to whether by an instrument in writing, duly executed, delivered and recorded, he assigned an undivided interest in said alleged inventions and improvements and said application and any patent that might be issued thereon, to Thompson M. Connor and John B. Dougan, these defendants have no information, except from the allegations of the bill of complaint herein, and so they neither admit nor deny the allegations of the bill in that particular, but leave the complainants to make such proof thereof as they may be advised is material or necessary; but these defendants admit that letters patent No. 356,067 were issued to the said Thompson M. Connor and John B. Dougan.

17 These defendants, further answering, say that as to whether on or about the 28th day of March, 1887, by an instrument in writing, duly drawn, executed and delivered, all the right, title and interest in and to said letters patent No. 357,067 and the alleged inventions and improvements therein described and claimed were vested in the complainants, these defendants have no knowledge, except from the allegations of the said bill of complaint in that particular, and so these defendants do not admit said allegations, but call upon the complainants to make strict proof of the same.

These defendants further say that as to whether one William J. Davisson was the original and first inventor of certain alleged new and useful improvements in wire-fabric machines, and as to whether such alleged inventions or improvements were not known or used before his invention thereof, and as to whether said alleged inventions or improvements were not in public use or on sale in the United States for more than two years prior to his application for letters patent therefor, and as to whether said alleged inventions or improvements were not patented or described in any printed publication in this or any foreign country before he applied for letters patent thereon, and as to whether he made application for letters patent in manner and form as required by the statute, and as to whether by an instrument in writing, duly executed, delivered and recorded, he conveyed an interest in said alleged inventions or improvements and in any patent that might be issued thereon to Jonathan A. Botkin, these defendants have no knowledge or information, except from the allegations of said bill in — particular, and so they neither admit nor deny the allegations of said bill in respect thereto, but leave the complainants to make such proof thereof as they may consider material or necessary; but these defendants admit that letters patent of the United States No. 289,507 were issued December 4, 1883, to William J. Davisson and Jonathan A. Botkin.

These defendants, further answering, say that as to whether on or about the 12th day of May, 1896, by duly drawn, executed and recorded instruments, in writing, all the right, title and interest in and to said letters patent No. 289,507 and the alleged inventions and improvements therein described and claimed became vested in the complainants, these defendants have no knowledge or information,

except from the allegations of the bill in that particular; and so these defendants do not admit such allegation-, but call upon the complainants for strict proof in reference to the same.

These defendants, further answering, say that as to whether one John C. Pope was the original and first inventor of certain other
18 alleged new and useful improvements in wire-fabric machines, and as to whether said alleged inventions or improvements were not known or used before his alleged invention thereof, and as to whether said alleged inventions or improvements were not in public use or on sale in the United States for more than two years prior to his application for letters patent therefor, and as to whether said alleged inventions or improvements were not patented or described in any printed publication in this or any foreign country before his said application for letters patent therefor, and as to whether he made application for letters patent covering said inventions or improvements in manner and form as required by the statute, and as to whether by an instrument in writing, duly executed, delivered and recorded, he assigned said alleged inventions and improvements and any patent that might be issued therefor to the complainants, these defendants have no knowledge or information except from the allegations of the bill in that particular, and so neither admit nor deny said allegations, but leave the complainants to make such proof thereof as they may be advised is material or necessary; but these defendants admit that letters patent of the United States No. 505,607 were issued to the complainants September 26, 1893.

These defendants, further answering, deny that the several inventions described, shown and claimed in said letters patent, numbered, respectively, 356,322, 357,067, 289,507 and 505,607, are capable of conjoint use in the same machine for making twisted wire fabric for use as fencing, or for any other purpose, and they deny that they are so embodied and used in the same machine for such purpose, or for any other purpose, by the said defendants, or any or either of them, or that they are so used by the complainants in the machines now or heretofore manufactured by them under the aforesaid letters patent, and they claim the same benefit and advantage of this fact as if they had specifically demurred to the said bill of complaint therefor.

These defendants, further answering, say that as to whether about the date of the grant of the first-mentioned letters patent the complainants engaged extensively, or at all, in the manufacture, use and sale of wire-fabric machines, built under and in accordance with said letters patent, and as to whether during the same year they engaged in the manufacture, use and sale of wire-fabric machines embodying the alleged inventions and improvements of the said Davisson and Connor patents, and as to whether about the date of the said Pope patent they engaged in introducing and thereafter embodying the alleged inventions and improvements embraced in said
19 patent, and as to whether ever since the first-mentioned date the complainants have devoted much or any time and expense to introducing to the public, manufacturing, selling and bring-

ing into use wire-fabric machines embodying said alleged inventions and improvements, and as to whether they have ever since been and still are extensively engaged in manufacturing, advertising, bringing into use, or vending the said machines embodying said alleged inventions and improvements under said letters patent, and as to whether they have during each year, including and since 1887, made and sold a large or any number of said machines, and as to whether they have been throughout the exclusive manufacture-s thereof, and as to whether they brought suit as alleged in said bill of complaint; and as to whether they have retained throughout the ownership and exclusive control of said letters patent and each of them, and as to whether the machines manufactured and sold by the complainants have gone into very extensive or any use throughout this country and in other countries, and as to whether the complainants' rights in respect to the same have been generally or at all acquiesced in and respected by the public, and as to whether the complainants have made extensive or any preparation for supplying the trade therewith, and have made large or any investments for such purpose, and as to whether they are now and in the past have been prepared to supply the demand for such machines throughout this and other countries, these defendants do not admit the allegations of the bill of complaint in these particulars, but call upon the complainants to make such proof thereof as they may be advised is material or necessary; but these defendants allege the fact to be that the complainants have sold the right to manufacture, sell, and use machines under some, if not all, of said letters patent and parted with all interest in and under said letters patent as to such territory, and have no right or interest therein under said letters patent, and that many, if not all, of the machines made and sold by the defendant company, which are complained of in the bill of complaint herein, have been for use in territory which the complainants have sold under some, if not all, of said letters patent and in respect to which they have no right or interest whatever under said letters patent so sold, as above explained.

These defendants, further answering, say that as to whether the complainants have given sufficient or any notice to the public that their machines embodying the said alleged inventions or improvements were patented by affixing upon the said machines the word "Patented" or otherwise, they are not informed, and so they do not admit the allegations of the said bill of complaint in reference thereto, but call upon the complainants for strict proof of the same.

These defendants, further answering, deny that they have confederated together, or conspired, or contrived to injure the complainants, or to deprive them of the benefits, advantages and rights which they were properly and lawfully entitled to under and by reason of said letters patent, or any of them, before the commencement of this suit, or at any other time, at Kokomo, Indiana, or elsewhere in the United States, manufactured, sold or used wire-fabric machines in violation or infringement of the rights of the complainants under said several letters patent, or any or either of them; they deny that

they have wilfully, unlawfully, wrongfully, or otherwise, combined or confederated together to appropriate unto themselves the said alleged invention or improvements, or to infringe upon the said several letters patent, or any or either of them; and they deny that they have manufactured or sold wire-fabric machines copied after the complainants' machines and which embody or contain the alleged inventions and improvements covered and secured in and under said several letters patent, or any or either of them.

These defendants, further answering, deny that the said defendants Jesse H. Srofe, Harry Ward, John E. Frederick, Kittie Srofe, George W. Frederick and Joel Ward are engaged together at Kokomo, Indiana, or elsewhere, in manufacturing, advertising, or selling wire-fabric machines embodying the alleged inventions or improvements described and claimed in said letters patent, or any or either of them, as partners under the name of the Kokomo Fence Machine Company, or otherwise, or that the said defendant company succeeded them or continued the business of said supposed firm, or that said individual defendants took or owned the entire stock of the defendant company, or that all of said individual defendants are, or ever have been, stockholders in said company, or that said company was incorporated for the purpose of enabling the individual defendants to infringe said letters patent or any or either of them and to distribute the profits accruing therefrom without incurring personal liability therefor, or that said corporation has no substantial or visible or available assets sufficient to satisfy a judgment herein or to afford the complainants any adequate remedy in a recovery of damages or profits, or that such company is incorporated for a trivial amount, or that such of the individual defendants as are interested in said defendant company entered into the same for the purpose of confederating together in an infringement of the
21 complainants' patents, or any or either of them, and carrying on the manufacture and sale of wire-fabric machines without incurring personal responsibility therefor.

These defendants, further answering, deny that *that* they or any of them have made and realized large or any benefits and advantages from the manufacture, sale, or use of wire-fabric machines in infringement or violation of any rights of the complainants under said letters patent, or any or either of them, or that they have set the complainants' rights at defiance, or threatened so to do, or that they have committed any acts of which the complainants have any legal right to complain; but these defendants allege that in their manufacture, sale, or use of wire-fabric machines they have done nothing but what they were entitled of right to do, and they deny that they have caused the complainants great or any irreparable damage by any improper or unlawful act on their part, or that they have deprived them of large or any profits which lawfully belong to them under said letters patent, or any or either of them, or that would lawfully accrue to them under said letters patent, or any or either of them.

These defendants, further answering, say that the defendant, George W. Frederick, is not in any way, form or manner—as an

officer, director or stockholder—connected with the business carried on by the defendant company, and never has been, and that the defendants, Kittie Srofe and Joel Ward are not officers or directors of said defendant company, and never have been, and that the defendants, Jesse A. Srofe, Harry Ward and John E. Frederick, as individuals, are not engaged in manufacturing, selling or using wire-fabric machines, and never have been, and that all wire-fabric machines that have been manufactured, sold, or used by any of the defendants have been by the defendant company as a corporation and in its corporate capacity.

These defendants, further answering, upon information and belief, allege that the various combinations described and claimed in the letters patent sued on herein, or material parts thereof, were known and described in printed publications in this and other countries long prior to the alleged invention thereof by the complainants or those from whom they claim to have derived title, as will appear from letters patent of the United States and foreign countries issued long prior to the alleged invention thereof by the complainants, or those from whom they claim to have derived title, and that in substantiation of this allegation these defendants refer to the following letters patent of the United States and foreign countries, viz:

22 *United States Letters Patent.*

No.	4,039	Cornelius & Mott	May 10, 1845
"	4,608	J. McMullen	June 27, 1846
"	10,743	J. Nesmith	April 4, 1854
"	13,391	L. Hull	August 7, 1855
"	43,888	Jouannin, Baudouin & Baudouin	August 16, 1864
"	88,576	G. Mason	April 6, 1869
"	98,461	B. Arnold	January 4, 1870
"	104,381	A. Vivarttas	June 14, 1870
"	112,946	McCahey & Salisbury	March 21, 1871
"	113,779	C. W. Latham	April 18, 1871
"	133,951	D. J. Powers	December 17, 1872
"	152,531	W. Taylor	June 30, 1874
"	154,563	D. J. Powers	September 1, 1874
"	209,520	C. K. Sawyer	October 29, 1878
"	213,617	L. Brightman	March 25, 1879
"	218,323	I. Sedgwick	August 5, 1879
"	233,033	I. Sedgwick	October 5, 1880
"	242,463	E. Malhere	June 7, 1881
"	293,020	Hedtmann, Henkels, Schmidedl & Fischer	February 5, 1884
"	309,724	Middaugh & Wilcox	December 23, 1884
"	310,254	H. S. Combs	January 6, 1885
"	312,063	G. Q. Adams	February 10, 1885
"	320,582	Panse & Klotz	June 23, 1885
"	327,924	W. F. Dennis	October 6, 1885
"	340,385	J. P. Tolman	April 27, 1886

"	341,230	E. Gilbert	May 4, 1886
"	347,064	W. H. Reppeto	August 10, 1886
"	360,155	W. A. Holmes	March 29, 1887
"	379,008	W. F. Dennis	March 6, 1888
"	380,664	B. Scarles	April 3, 1888
"	380,665	B. Scarles	April 3, 1888
"	387,739	B. Scarles	August 14, 1888
"	417,934	W. & W. C. Orr	December 24, 1889
"	419,480	J. M. Snyder	January 14, 1890
"	432,951	E. S. Morgan	July 22, 1890

23

"	433,633	B. Scarles	August 5, 1890
"	441,437	H. B. Morris	November 25, 1890
"	453,006	G. P. Rishel	May 26, 1891
"	455,406	A. Land	July 7, 1891
"	483,181	H. H. Swinscoe	September 27, 1892
"	483,182	H. K. Swinscoe	September 27, 1892
"	483,969	B. Scarles	October 4, 1892
"	484,528	W. D. Whitney	October 18, 1892
"	502,148	J. A. Tatro	July 25, 1893
"	505,890	W. D. Whitney	October 3, 1893
"	552,025	W. D. Whitney	December 24, 1895

English Letters Patent.

No.	251	of 1854
"	2516	of 1876
"	2317	of 1885 and
"	1285	of 1854

Without this that any other matter, cause, or thing in said bill of complaint contained material or necessary to be answered unto, and not herein and hereby well and sufficiently answered unto, traversed or denied, confessed and avoided, is true, all of which matters and things these defendants are ready and willing to aver, maintain and prove as this honorable court may direct, and they pray to be hence dismissed with their reasonable costs and charges in this behalf most wrongfully sustained.

KOKOMO FENCE MACAINE CO.,
Per J. E. FREDRICK, *Sec. and Treas.*
J. H. SROFE.
KITTY SROFE.
JOHN E. FREDRICK.
GEORGE W. FREDRICK.
HARRY WARD.
JOEL WARD.

BLACKLIDGE & SHIRLEY,
BAKER & MILLER,
BANNING & BANNING,
Solicitors for Defendants and of Council.

U. S. circuit court, district of Indiana. Alva L. Kitselman, *et al.*, vs. Kokomo Fence Machine Co., *et al.* Answer.

24 And afterwards, to wit, at the May term of said court, on the 2nd day of June 1898, before Honorable John H. Baker, judge of said court, the following further proceedings in the above-entitled cause were had, to wit:

Come now the complainants, by Robert H. Parkinson, Esq., their solicitor, and file their replication herein, in the words following, to wit:

Replication.

Filed June 2, 1898.

25 & 26 Circuit Court of the United States for the District of Indiana.

ALVA L. KITSELMAN and DAVIS M. KITSELMAN *vs.* KOKOMO FENCE MACHINE CO., JESSIE H. SROFE, Kittie Srofe, Harry Ward, Joel Ward, John E. Frederick, George W. Frederick.	In Equity. No. 9574.

The replication of the above-named complainants to the joint and several answer of the above-named defendants.

These repliants saving and reserving to themselves, now and at all times hereafter, all and all manner of benefit and advantage of exception which may be had or taken to the manifold insufficiencies of said joint and several answer, for replication thereunto, say that they will aver, maintain, and prove their bill of complaint to be true, certain, and sufficient in law to be answered unto; and that the said joint and several answer of the said defendants is uncertain, untrue, and insufficient to be replied unto by these repliants; without this, that any other matter or thing whatsoever in the said joint and several answer contained, material or effectual in the law to be replied unto and not herein and hereby well and sufficiently replied unto, confessed and avoided, traversed or denied, is true; all which matters and things these repliants are and will be ready to aver, maintain, and prove, as this honorable court shall direct, and humbly pray as in and by their said bill they have already prayed.

(Signed) ROBERT H. PARKINSON,
Solicitor for Complainants.

27 United States Circuit Court, District of Indiana.

ALVA L. KITSELMAN and DAVIS M. KITSELMAN, Copartners as Kitselman Bros., vs. KOKOMO FENCE MACHINE CO., JESSE H. SROFE, HARRY WARD, JOHN E. FREDERICK, KITTIE SROFE, GEORGE W. FREDERICK, JOEL WARD.	In Equity.	No. 9574.

Evidence on behalf of complainants, taken before and by Charles L. Hine, notary public, acting as special examiner by agreement of parties, at the office of Robert H. Parkinson, Esq., 1543 Monadnock block, Chicago, Illinois, beginning on Wednesday, July 27, 1898, at 11 o'clock a. m.

Present: Robert H. Parkinson, Esq., on behalf of the complainants; Thomas A. Banning, Esq., on behalf of the defendants.

It is agreed by the parties hereto that Charles L. Hine, notary public, of Chicago, Cook Co., Illinois, may act as special examiner herein with the same force and effect as if duly commissioned by the court for said purpose; and it is further agreed that any notary public selected by either party may act as such special examiner with the same force and effect as if duly commissioned.

It is further agreed that uncertified Patent Office printed copies of specifications and drawings may be used in evidence as *prima facie* proof of the issue at the date appearing thereon of letters patent of the United States containing such specifications and drawings and to have, unless subsequently corrected, the same effect as duly certified copies of such patents; also that printed copies of British specifications and drawings and patents may be used in evidence as *prima facie* proof (subject to correction), the dates and other description appearing thereon to have the same effect as if duly certified copies were used, subject, however, to correction, if error appear.

28 Complainants here offer in evidence the several patents in suit, to wit, the Davisson patent No. 289,507, of December 4, 1883, which is marked "Complainants' Exhibit Davisson Patent;" the Kitselman patent No. 356,322, dated January 18, 1887, which is marked "Complainants' Exhibit Kitselman Patent;" the Conner patent No. 357,067, dated February 1, 1887, which is marked "Complainants' Exhibit Conner Patent;" and the Pope patent No. 505,607, dated September 26, 1893, which is marked "Complainants' Exhibit Pope Patent."

Complainants here produce and offer in evidence the following assignments, to wit: Assignment of the above-mentioned Davisson patent from Jonathan A. Botkin and William J. Davisson to Edwin F. Kitselman, dated May 11, 1896, which is marked "Complainants' Exhibit Davisson Assignment No. 1;" also assignment of the same patent from Edwin F. Kitselman to Alva L. Kitselman and Davis Monroe Kitselman, dated May 12, 1896, which is marked "Complainants' Exhibit Davisson Assignment No. 2;" also an assignment

of the above-mentioned Conner patent from Theodore M. Conner, Thompson M. Conner and John B. Dougan to Alva L. Kitselman and Davis M. Kitselman, dated March 28, 1887, which is marked "Complainants' Exhibit Conner Assignment."

By DEFENDANTS' COUNSEL: Mr. Banning objects to the foregoing assignments, and each of them, as evidence, because no proof has been offered explaining the interlineations which appear in some of them, nor has any proof been offered as to the genuineness of the signatures of the parties whose names appear to be signed to said assignments respectively.

After consideration and consultation with Mr. John E. Frederick, Mr. Banning states that he withdraws the above objection, and consents that the assignments and signatures may be taken *prima facie* to be genuine and what they purport to be, and that copies may be made by the examiner and used in the record in lieu of the originals with the same force and effect as such originals.

Complainants proposing to introduce proof of notice to defendants of the infringement alleged in the bill, it is admitted by defendants that notice of the charge of infringement as alleged in the bill was given to and received by defendants J. H. Srofe, Harry Ward, John E. Frederick, George W. Frederick, Joel Ward and the
29 Kokomo Fence Machine Co., on or about the date alleged in said bill, said notices being substantially alike, and one of them reading as follows:

"JULY 14, 1896.

"John E. Frederick, Esq., Kokomo, Indiana.

"DEAR SIR: We are informed by our clients, Messrs. Kitselman Bros., of Ridgeville, Indiana, that you are about to start a factory at Kokomo, Indiana, under the name of the Kokomo Fence Machine Co., and for the purpose of manufacturing a woven-wire fence machine, licensed under patent No. 552,025, granted to W. D. Whitney, of Clarendon, N. Y., and at the request of Kitselman Bros., we have examined said Whitney patent in connection with the patents owned and controlled by Messrs. Kitselman Bros., Nos. 356,322, 505,607, 357,067 and 289,507, and it is our opinion that the manufacture, sale or use of a machine constructed after the plan of the Whitney patent will be a clear infringement of the patents owned by Kitselman Bros., and we have been instructed to notify you that our clients, Messrs. Kitselman Bros., will hold you individually, and as a stockholder in said Kokomo Fence Machine Co., liable for damages arising from any overt act of infringement by said Kokomo Fence Machine Co., and its agents, or those acting under or by virtue of its authority.

"Yours truly, C. A. SNOW & CO."

Complainants here offer in evidence a certified copy of the articles of incorporation of the Kokomo Fence Machine Co., which is as follows, it being agreed that this copy made by the examiner may be used in lieu of the certified copy and with the same effect:

"*Articles of Incorporation of the Kokomo Fence Machine Company, at Kokomo, Howard County, Indiana.*

"Art. 1. The object of this company is to manufacture and sell woven-wire fence machines, buy and sell wire, and other things connected with the fence business deemed advisable by the company.

"Art. 2. The name of this corporation shall be the Kokomo Fence Machine Company.

30 "Art. 3. The authorized capital stock of the corporation shall be $6,000.00, limited, and shall be divided into sixty shares of one hundred dollars each ($100.00) and shall be non-assessable unless it be by the unanimous vote of all the stockholders. The term of existence is not to exceed fifty years.

"Art. 4. The business of this company shall be controlled and managed by a board of three directors who shall have full control of the business of the company, and no business shall be done without the consent of all the directors, and said directors shall be elected by the stockholders at the annual meeting. All directors must be stockholders.

"Art. 5. The directors shall be elected by ballot and shall serve one year, or until their successors are elected and qualified; and when so elected and qualified, shall before entering upon their duties take an oath that they will faithfully and honestly discharge their duties as such.

"Art. 6. The directors shall elect from their number a president, vice-president, or manager, secretary and treasurer, who shall each take an oath to faithfully perform their duties as such. The treasurer shall execute a bond in such sum as may be deemed proper by the board of directors.

"Art. 7. The board of directors shall be elected annually by the stockholders at such time as may be designated by the board or specified in the by-laws. At all elections of directors, each stockholder shall be entitled to one vote for each share of stock held by them. The stockholders may vote by proxy if duly authorized in writing.

"Art. 8. The general business of this company shall be under the control and management of the board of directors, who may meet on the 1st Tuesday of each month at 1 o'clock, p. m., at the general office of the company, and shall keep a record of the acts and proceedings, and such record shall at all times be subject to examination or inspection by any stockholder.

"Art. 9. The board of directors may from time to time, by a unanimous vote, make and establish such by-laws as may be deemed proper for the regulation and transaction of its business, and provide the manner in which its stock shall be transferred on the books of the incorporation. All of the directors shall constitute a quorum with power to act at any meeting.

"Art. 10. There shall be no stock transferred by any mem-
31 ber of this company, or incorporation, unless it be by the consent in writing of all the stockholders.

"Art. 11. The corporate seal of this incorporation shall contain the corporate name with town and State in the outer circle, and within the circle there shall be the words "organized," with the date of the day, month, and year.

"Art. 12. The names and place of residence of the stockholders, and the number of shares taken and held by each are as follows: We the members of this incorporation hereby subscribe our names and rights in this article of incorporation, and place opposite our names o-r place of residence, and the number of shares held by us. We agree to pay unto said corporation, said capital stock in full within eighteen months from organization of this company, as specified by the by-laws.

"Names.	Residence.	Shares.
Harry Ward	Ridgeville, Ind	Twenty
J. E. Frederick	Ridgeville, Ind	Twenty
Mary C. Srofe	Kokomo	Eighteen
J. H. Srofe	Kokomo	Two

"Subscribed and sworn to before me this 29th day of April, 1896.
"[SEAL.] H. M. COOPER, *Clerk.*"

932 101 Articles of incorporation of the Kokomo Fence Machine Company.
Filed April 30, 11.49 a. m. 1896.

W. D. OWEN,
Sec'y of State.

"UNITED STATES OF AMERICA, }
"*State of Indiana.* }

"OFFICE OF THE SECRETARY OF STATE.

"I, William D. Owen, secretary of state of the State of Indiana, hereby certify that the annexed pages contain a full, true and complete copy of the articles of association or agreement in writing of Kokomo Fence Machine Company, with the several certificates thereon, filed April 30, 1896, as the same appears on file, as
32 the law directs, in this office.

"In testimony whereof, I hereunto set my hand and
[SEAL.] affix the great seal of the State of Indiana. Done at my office, in the city of Indianapolis, this 13th day of July, A. D., 1898.

"WILLIAM D. OWEN,
"*Secretary of State.*"

COMPLAINANTS' EXHIBIT DEFENDANTS' MACHINE.

Complainants here offer in evidence a wire-fence-making machine bearing the name plate of the defendant, The Kokomo Fence Machine Co., and in order to dispense with formal proof concerning the same, complainants request defendants to admit that wire-fence machines similar in all substantial respects to this exhibit have been

manufactured and sold by these defendants both before and since the commencement of this suit and before and since the notice to defendants heretofore referred to and that the same have been manufactured by the corporation since its existence and by the stockholders thereof, (or, if not all the stockholders, such stockholders as were connected with its manufacture) prior to said incorporation, said manufacture having both before and since such incorporation been carried on at Kokomo, Indiana, and the sale of such machines having been made there and at Bloomington, Illinois, and elsewhere in the United States.

By DEFENDANTS' COUNSEL: Mr. Banning, after consultation with the defendant John E. Frederick, admits that the machine offered in evidence is a machine manufactured and sold by the defendant company some time during the year 1897, and that the defendant company has manufactured and sold, and is still manufacturing and selling, other machines substantially like it, in construction and mode of operation, and that such manufacture and sale have taken place, and are taking place at Kokomo, Indiana. Mr. Banning states, however, that he can make no admission as to the manufacture and sale on the part of the individual defendants, as he is advised that no such manufacture or sale has ever taken place.

The machine above referred to is marked "Complainants' Exhibit Defendants' Machine."

Recess until 2 o'clock p. m.

33 After recess.

JOHN E. FREDERICK, a witness produced on behalf of the complainants, being first duly sworn, deposes and says, in answer to interrogatories propounded to him by Mr. Parkinson, on behalf of the complainants, as follows:

Q. 1. Please state your name, age, residence and occupation.

A. John E. Frederick; 32 years; occupation, manufacturer; residence, Kokomo, Indiana.

Q. 2. Are you one of the defendants in this case?

A. Yes, sir.

Q. 3. When you state your occupation to be manufacturer, what class of manufacturing do you refer to?

A. Machinery.

Q. 4. What class of machinery?

A. Fence machinery and articles connected therewith.

Q. 5. Do you include under this machines such as "Complainants' Exhibit Defendants' Machine"?

A. Yes, sir.

Q. 6. How long have you been engaged in or connected with the manufacture of that machine or machines substantially similar thereto?

A. Well, since the—I could not answer that exactly as to the day—but after the incorporation of our company, possibly sixty to ninety days after.

Q. 7. That would bring your first connection with the manufacture

of such machines at about what date, according to your best recollection?

A. Well, somewhere between the latter part of May and the middle of June, 1896, I think.

Q. 8. Had you not begun advertising that machine and begun its manufacture prior to the date of incorporation?

A. We advertised in the newspapers a fence as built with our machine, but we did not begin the manufacture of the machine so far as the sale was concerned until after we had begun advertising.

Q. 9. Observe that my question is not when you begun the sale of the machine, but when you begun its manufacture, and my question is not confined specifically to sale or manufacture for sale, but refers to your first manufacture or steps toward the manufacture of that machine.

34 A. I answered as near in the preceding question as is possible in regard to the date at which we begun the manufacture of the machine, which was somewheres between the latter part of May and the middle of the following month.

Q. 10. Is it not a fact that you had built a machine of this kind before May, 1896?

A. Possibly an experimental machine, but never a complete, working machine.

Q. 11. Is it not true that you had built a machine before April, 1896?

A. No, sir.

Q. 12. Are you positive about this?

A. Yes, sir.

Q. 13. Had you not begun the construction of one of these machines before April, 1896?

A. No.

Q. 14. You mean to be understood as stating positively, do you, that you had not begun to make any machine of this kind before April, 1896?

A. Yes, sir.

Q. 15. How early in April did you begin to make such machines?

A. We did some pattern-work in April, the dates I could not tell exactly.

Q. 15.* You made portions of the machine before the 29th of April, 1896, did you not?

A. What do you mean by portions of the machine; please explain. Do you mean patterns?

Q. 16. I wish you to state whether you begun the construction of a machine substantially like this exhibit, or made any portion of such a machine, or did any work toward building such a machine, before April 29, 1896?

A. None, except it might have been a piece of pattern-work; whether there was anything of the kind done, I cannot say. We did not manufacture any machine prior to the 29th of April, 1896.

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* (Two questions are numbered 15.)

Q. 17. Did you operate any such machine prior to April 29, 1896?
A. No, sir.
Q. 18. You never used any such machines prior to April 29, 1896.
35 A. No, sir.
Q. 19. Did you ever own or have any interest in such a machine prior to April 29, 1896?
A. I don't remember whether there was a model machine furnished by the party from whom we bought the patent or not, but I think there was. This machine was never used in building fence by any of us and had no value other than a model pattern or drawing.
Q. 20. Had you not experimented with that machine prior to April 29, 1896?
A. No, sir.
Q. 21. Between April 29, 1896, and July 14, 1896, what had you done with that machine or toward manufacturing similar machines?
A. We had been manufacturing machines at that time.
Q. 22. You had been manufacturing machines substantially similar to "Complainants' Exhibit Defendants' Machine," had you?
A. Yes, sir.
Q. 23. Who do you mean by "we"?
A. The members of the Kokomo Fence Machine Co.
Q. 24. Who were they then and who are they now?

By DEFENDANTS' COUNSEL: Mr. Banning objects to the question as incompetent and immaterial, inasmuch as it is not confined to the parties who have been made defendants in this case.

A. At the organization of the company they were composed of Jesse H. Srofe, Mary C. Srofe, Harry Ward and J. E. Frederick.
Q. 25. Is the Mary C. Srofe to whom you refer commonly known as Kittie Srofe?
A. Yes, sir.
Q. 26. Are all these parties that you have named still stockholders in this company?
A. Yes, sir.
Q. 27. Was not George W. Frederick interested in the Kokomo Fence Machine Co., at the time of its organization?
A. He has never been a stockholder in the company.
Q. 28. Has he not had an interest in the stock of the company?
A. None.
36 Q. 29. Do you not hold stock in which he has a contingent interest?
A. No, not at the present time.
Q. 30. Have you not prior to this time held stock in which he had an interest?
A. No, sir, not in ownership.
Q. 31. What kind of an interest had he in that stock?
A. That is purely a personal matter between us, and is in no way to be considered as being at this time or at any future time a holder

of stock other than that which would entitle him to remuneration for value received.

Q. 32. Please explain just what interest in or claim to or right in respect to stock in this company George W. Frederick has or has had at any time during the existence of the company.

A. I have answered that he held no stock nor any interest at this time or any future time except that which he might at some future time hold in compliance with a personal understanding between us, the result of a personal obligation. He has had no interest in the past.

Q. 33. Is it not true that you hold certain stock which it is understood and agreed is held for his benefit and which he can claim the benefit of, if he chooses to do so?

A. No, sir, except subject to the conditions mentioned before.

Q. 34. How long have you held stock in this company for his benefit "subject to the conditions mentioned before"?

A. I could not exactly state that.

Q. 35. State as nearly as you can.

A. Well, I judge about six months; maybe a little longer than that. I could not answer that definitely.

Q. 36. You so held it prior to the commencement of this suit, did you not?

A. Yes.

Q. 37. What are the conditions under which this is held for his benefit?

A. To remunerate him in case of failure to comply with certain agreements.

Q. 38. Do those agreements relate to indemnifying him against liabilities in respect to this fence-machine business?

A. No, sir.

Q. 39. Had he not at or about the time this Kokomo Fence
37 Machine Co. was formed an interest in the business?

A. No, sir.

Q. 40. Was he not employed in connection with the business?

A. No, sir.

Q. 41. Had he never been employed in connection with this business, or interested in it or the company in any way, except as he may be interested in the stock held under the conditions mentioned by you?

A. No, sir.

Q. 42. Was there not an arrangement by which he was to move to Kokomo for the purpose of taking part in the business if the business increased?

A. No, sir.

Q. 43. Was there never any arrangement or understanding about his going into the business or taking stock in it or employment under the company?

A. No, sir.

Q. 44. Is not Joel Ward a stockholder in the company?

A. Yes, sir.

Q. 45. Has he been throughout?

A. No, sir.

Q. 46. When did he become so?

A. In April last.

Q. 47. Had he not been interested in the company before that time?

A. I know nothing about it. If there was any agreement between him and the party who assigned him stock, I have no definite knowledge.

Q. 48. Had you not advertised defendants' machine before April 29, 1896?

A. I cannot give the date of the first advertisement that we inserted. However, I rem-ber the paper and the time, but could not state exactly the date. It was before we had manufactured any machines.

Q. 49. When did you buy the patent referred to in answer 19?

A. In stating that we bought a patent, I was in error. That should have been a license.

Q. 50. When did you buy that license?

A. The contract, I think, was closed in March of 1896. I cannot give the exact date.

Q. 51. That was the license under which you claimed to
38 manufacture the machine in evidence as defendants' machine, was it?

A. Yes, sir.

Q. 52. Who bought that license at that time?

A. J. H. Srofe, Harry Ward and myself.

Q. 53. Were any of these other present defendants interested in that purchase or connected with it?

A. No, sir.

Q. 54. Did the contract made at that time provide for your manufacturing and selling this machine?

A. The contract embodied specific requirements in regard to advertising and the number of machines that were to be sold within a given time and there were certain restrictions in regard to—but the contract is on record, and you can get a copy of it.

Q. 55. Have you this contract or a copy of it accessible so that you can produce it now?

A. I can produce it, and will be glad to do so, if you care to have it, but not now.

Q. 56. Will you kindly have the contract sent to your counsel, with permission for me to inspect it and take a copy of it, if I desire?

A. Yes, sir.

Q. 57. As soon as this contract or license was made you and J. H. Srofe and Harry Ward began to make arrangements for carrying out the contract and manufacturing the wire-fence machine under it?

A. Yes, sir, we proceeded to organized our company.

Q. 58. Did you not begin to advertise the machine just after this license was granted?

A. No, not just after the license was granted we did not. There

was no advertising done until after our by-laws and articles of incorporation had all been written and signed. Whether we had it acknowledged or not before the placing of the advertisement, I cannot answer definitely.

Q. 59. Had you not made arrangements about a place of business to manufacture these machines before the date of incorporation?

A. Yes, sir.

Q. 60. Who of the defendants were parties to that arrangement?

A. The members of the company.

39 Q. 61. Had you not made arrangements with T. M. Conner to go to Kokomo and work on these machines before the date of incorporation?

A. Yes, sir; but not before we had our articles of incorporation and by-laws drawn off or written.

Q. 62. How long before they were executed did you have the articles of incorporation and by-laws drawn up?

A. A few days after the contract had been properly signed by which we acquired the right to manufacture, sell and use this machine.

Q. 63. This contract was signed at the date it bears, was it?

A. Yes, sir; at the dates it bears.

Q. 64. Did not Conner begin work on patterns on this machine in your behalf before he went to Kokomo to work for you?

A. Yes, sir; he made one pattern, I believe, under contract, not as our employé.

Q. 65. Do you mean a pattern for one machine?

A. One pattern, out of the number of patterns required, for a spool-carrier.

Q. 66. You mean, do you, that he made the pattern for one spool-carrier for this machine?

A. He converted a master or wooden pattern into a brass pattern. This pattern was for a spool-carrier for this machine.

Q. 67. He did that under contract with you and your associates in this license, did he?

A. He did that prior to having our articles of incorporation acknowledged. These articles at this time were all drawn up prior to beginning manufacture.

The witness here requests an opportunity to consult apart with his counsel, and proceeds with his counsel into another room for that purpose.

The WITNESS: You understand by this that between the time of signing of the license by the contracting parties and the preliminary formation of our stock company there was no men employed or business transacted by this company.

Q. 68. Conner made that pattern of the spool-carrier for this machine pursuant to a contract between Conner and you and your associates in the license, did he not?

40 A. No; we, as a company instructed Mr. Srofe under the articles of agreement and laws that had been made to have the pattern made by Mr. Conner.

Q. 69. Then, it was pursuant to a contract made in behalf of the persons who became the original stockholders of the Kokomo Fence Machine Co. that Conner made this pattern at the time referred to, was it?

A. No, it was pursuant *of* instructions made by the members of the company who succeeded the licensees.

Q. 70. And these instructions were given in behalf of the members of the company who succeeded the licensees prior to the execution of the articles of incorporation, were they not?

A. Yes, sir. We had not yet had the articles acknowledged.

Q. 71. These members of the company who succeeded the licensees were the same individuals who organized the corporation and appear in the articles of incorporation as stockholders, were they?

A. Yes, sir.

Q. 72. Who furnished Conner with the wooden pattern from which he made that brass pattern?

A. Under the contract, or instrument by which we received our license, it was part of the agreement that all patterns then in existence were to be furnished the licensees to be used in making brass patterns, the same to be held the property and at the disposal of the licenser. These patterns after the license was executed was shipped to us from Albany, N. Y., and arrived in Ridgeville ten days or two weeks after the license was executed, to the best of my knowledge.

Q. 73. Were you living in Ridgeville at that time?

A. Yes, sir.

Q. 74. And where did your two associates in the license live?

A. Ridgeville.

Q. 75. You refer to Ridgeville, Ind.?

A. Yes, sir; Ridgeville, Ind.

Q. 76. When did T. M. Conner go to Kokomo to work for you?

A. I could not answer that question without referring to our books.

Q. 77. Was it before or after your incorporation?

41 A. It was before the acknowledgment of our articles of agreement.

Q. 78. The fence machine which your company was organized to manufacture and which it began to manufacture as soon as it got into operation was a machine substantially the same as this Exhibit Defendants' Machine, was it not?

A. Yes, sir.

Q. 79. That was the first style of machine that your company made and the only style that it has had on the market?

A. Yes, sir; they have all been essentially the same.

Q. 80. Will you ascertain the date of the first advertisement of this machine and the paper in which it was first advertised by either you and your associates in the license or by either of the stockholders in the company, and advise the examiner hereafter so that it may be noted as an answer by you?

A. The first advertisement placed by our company was in the Ohio Farmer, of Cleveland, Ohio, and I will supply you with the date, if possible.

Q. 81. Did you put out any circulars before that advertisement?
A. Yes, sir; I think we did.
Q. 82. Can you not ascertain when they were first put out, or first printed, and supply a copy?
A. I think we can give you the date of the invoice for the first printed matter that we had printed, and will do so, if possible.
Q. 83. You put out some circulars of this machine which had been furnished you by Whitney before you printed any on your own behalf did you not?
A. Not to my knowledge; I know nothing about that. All circulars issued by us bore the name of our company.
Q. 84. You had been in the factory where the complainants were manufacturing their wire-fence machine, prior to the procurement of the license to which you refer, had you not?
A. Yes, sir.
Q. 85. What is your present connection with the defendant company?
A. I am a stockholder and officer, secretary and treasurer.
Q. 86. Have you held this office ever since it was organized?
A. Yes, sir.
Q. 87. Who are the other officers of the defendant company?
42 A. J. H. Srofe, president; Harry Ward, vice-president.
Q. 88. Have they held those offices, respectively, ever since the company was organized?
A. Yes, sir.
Q. 89. What, if any, relation or connection of Jesse H. Srofe is Kittie Srofe, otherwise Mary C. Srofe?
A. She is his wife.

Cross-examination by Mr. BANNING:

X Q. 90. You have stated in answer to question 1 that you were a manufacturer, and in answer to succeeding questions that you were a manufacturer of fence machinery like the machine offered in evidence as "Complainants' Exhibit Defendants' Machine," and in various questions you have been asked about how long you have been engaged in such business, etc. I will ask you to state whether you have been engaged in manufacturing fence or other machinery in your individual capacity, and whether you meant to be so understood?
A. No, sir.
X Q. 91. As a matter of fact, have you or any of the other individual defendants in this case, in their individual capacities, manufactured and sold any fence or machinery like the exhibit machine referred to?
A. No, sir.
X Q. 92. The various acts that you have been asked about which took place before the incorporation of the defendant company had been completed or consummated were in anticipation and in furtherance of the corporation which was in process of formation, were they not?

A. Yes, sir.

X Q. 93. Were you acting as partners or on your individual account in such matters?

Objected to as involving a question of law, therefore incompetent.

A. No, sir.

X Q. 94. Had preliminary steps toward the formation of the defendant corporation been entered into or agreed upon?

A. Yes, sir.

43 X Q. 95. You have spoken about various things having been done after your corporation papers had been prepared and written but before they were acknowledged. What acknowledgement do you refer to?

A. The acknowledgement made before the clerk of the court of Howard county, Indiana.

X Q. 96. This acknowledgement before the clerk or a notary or other qualified officer is one of the final acts in the formation of corporations in Indiana, is it not?

Last objection repeated.

A. Yes, sir.

X Q. 97. How were these various advertisements or circulars that you have been asked about signed—by individuals or in the name of the company?

A. In the name of the company.

X Q. 98. You have been asked about the contract with Mr. Conner for the making of a pattern. How was that pattern paid for and by whom?

A. Paid by the company.

X Q. 99. I will ask you to state whether or not all of the items of expense incurred in these various matters were paid for by the company and charged against it?

A. Yes, sir.

X Q. 100. You have been asked about the license for the fence machines which the defendant company has been making and selling. I will ask you to state what patent that license is under?

A. Patent granted to W. D. Whitney, No. 552,025, December 24, 1895.

X Q. 101. You have been asked about a place of business and arrangement for the same before the date of the incorporation. For whose benefit were those arrangements made?

A. For the benefit of the Kokomo Fence Machine Co.

X Q. 102. Did such company when its incorporation was completed occupy such place of business?

A. Yes, sir.

X Q. 103. You have been asked about some arrangement with Mr. Conner by which he was to go to Kokomo and work on

44 the machine before the date of the incorporation. Who has paid Mr. Conner and in whose employ has he been since then?

A. The Kokomo Fence Machine Co.

X Q. 104. Did any of the individual defendants hire him to work for them?

A. No, sir.

X Q. 105. As I understand you, all of these acts were done while the formalities of incorporating the defendant company were in process of completion. Is this correct?

A. Yes, sir.

X Q. 106. Is Kittie Srofe, George W. Frederick, or Harry Ward directors of the defendant company?

A. Harry Ward is a director, but the others are not, and George W. Frederick is not a member of the company.

X Q. 107. You have explained that George W. Frederick was not a stockholder of the company. Has he ever voted at a stockholders' meeting?

A. No, sir.

X Q. 108. Has be ever been entitled to so vote?

A. No, sir.

X Q. 109. Is Joel Ward a director of the defendant company?

A. No, sir.

X Q. 110. It has been noted on the record that you left the stand to consult with your counsel in another room. About how long were you and your counsel absent in the other room?

A. Less than a minute, I should judge.

Redirect examination by Mr. PARKINSON:

R. D. Q. 111. Who paid the items of expenses referred to in answers 97, 98 and 99 before the company was incorporated?

A. Prior to the election — the officers of this company, these items of expense were paid principally by J. H. Srofe, who was alone at our place of business, the money being furnished by all of the members of the company. Said items of expense that were so furnish-d were credited on subscribed stock. Prior to the time of the establishment of a place of business, this was paid by different members of the company, the same being credited upon subscribed stock, as before stated.

R. D. Q. 112. Many of the articles were thus paid before the articles of incorporation were executed, were they not?

A. A good portion of them.

45 R. D. Q. 113. From the time you obtained the license in March, were you and the persons who became, with you, the incorporators of this company, engaged in making arrangements for the manufacture of these fence machines and for the organization of this corporation to conduct that manufacture as a company?

A. Yes, sir.

R. D. Q. 114. Have you no other directors than the president, vice-president and secretary and treasurer?

A. No, sir.

R. D. Q. 115. Are those the only directors you ever had?

A. Yes, sir.

Recross-examination by Mr. BANNING:

R. X Q. 116. When you speak of amounts advanced by individuals as credited on subscribed stock, do you mean that each person who advanced money received a credit for it on the stock subscribed by him?

A. Yes, sir.

R. X Q. 117. Did Kittie Srofe at any time, so far as you know, advance any money before the incorporation of the company?

A. She received credit on subscribed stock for money paid into the company.

Adjourned to July 29, 1898, 10 o'clock a. m.

(Signed) JOHN E. FREDERICK.

46 CHICAGO, *July* 30, 1898, 11 o'clock a. m.

Met pursuant to agreement, the adjournment to yesterday going over until today.

Present: Parties as before.

MELVILLE E. DAYTON, a witness produced on behalf of the complainants, being first duly sworn, deposes and says, in answer to interrogatories propounded to him by Mr. Parkinson, on behalf of the complainants, as follows:

Q. 1. Please state your name, age, residence and occupation.

A. Melville E. Dayton; age, upwards of 60 years; occupation, scientific and practical mechanical expert; residence, Chicago, Illinois.

Q. 2. What education and experience have you had in the examination and comparison of mechanical structures and what opportunities of becoming both practically and scientifically acquainted with mechanical subjects and with the differences in construction and operation of machinery, and what, if any, attention have you given to machinery used in the construction of wire fence?

A. The careful examination and comparison of machines analytically has been my business for more than twenty-five years last past and for more than twenty years I have been called upon many times each year to testify as an expert relative to similarities and differences between machines and between machines and the descriptions and claims of letters patent. Beginning with 1871, I have been until recently actively engaged as a solicitor of patents, in which experience I prepared and prosecuted several thousand applications for patents on a great variety of mechanisms, which work has involved critical analysis of machines in a great number of the mechanical arts, including that of wire working and weaving, to which this case in general pertains, and I have also had occasion to testify in patent suits pertaining to this general class of machinery, notably in a great many barbed wire fence suits and suits relating to wire coiling.

I was equipped for this practical work by a natural aptitude for mechanics, by early contact and experience with many forms of op-

erative machinery, by a study of theoretic mechanics, by learning the machinist's trade and by the study and practice of mechanical drawing.

Q. 3. Have you examined the Davisson patent No. 289,507,
47 Kitselman patent No. 356,322, the Conner patent No. 357,067 and Pope patent No. 505,607, here in evidence, and do you understand the construction and operation of the mechanism exhibited and described therein?

A. I have very carefully studied said patents and believe that I understand the construction and operation of the mechanism therein set forth.

Complainants here offer in evidence three machines, marking them respectively, "Complainants' Exhibit Kitselman Machine No. 1;" "Complainants' Exhibit Kitselman Machine No. 2" and "Complainants' Exhibit Kitselman Machine No. 3."

Q. 4. Have you examined, both when idle and when in operation, "Complainants' Exhibit Kitselman Machines Nos. 1, 2 and 3" and defendants' machine here in evidence, and do you understand the construction and operation of these machines?

A. I have examined these machines, and have observed others like them in operation as well as idle, and I understand the construction and operation of each of them.

Q. 5. When you speak of having observed these machines in operation, do you, or do you not, refer to their operation in the actual construction of fence in the field?

A. I do.

Q. 6. I refer you particularly to the improvements described in the Davisson patent and recited in the second and third claims thereof, the improvements described in the Kitselman patent and recited in the first, second, ninth, tenth, eleventh, fifteenth and twentieth claims thereof, improvements described in the Conner patent and recited in the second and third claims thereof, and improvements described in the Pope patent and recited in the first, ninth and tenth claims thereof, and ask you, first, to state briefly whether either of these three complainants' machines referred to embodies these inventions, or any of them, and if so, which of these patents each of the three complainants' machines embodies in respect to the claims mentioned.

A. In my opinion, the Kitselman machine No. 1 embodies the inventions specified in the two mentioned claims of the Davisson patent and also the enumerated claims of the Kitselman patent. The Kitselman machine No. 2 embodies the same claims of the Davis-
48 son and Kitselman patents and the claims cited from the Pope patent. The Kitselman machine No. 3 embodies all the claims enumerated of the four patents in suit.

Q. 7. Have you examined "Exhibit Defendants' Machine" with reference to the question how far, if at all, it corresponds to the mechanisms described in these several patents and particularly recited in the claims enumerated in the last question? If so, please explain what, if any correspondence you have found, giving your

reasons for any opinions you may express, and stating whether or not it embodies, in your opinion, the improvements described and claimed.

A. I have examined defendants' machine with reference to the claims referred to in the question, and it is my opinion that said defendants' machine essentially corresponds with and contains the invention recited in each of said claims.

To make plain my reasons for this conclusion, it will be necessary to explain, briefly, the essential features of the invention set out in each of said patents. In doing this, I first remark that all these four patents in suit relate to the production of meshed wire fencing having longitudinal tension wires along its margins and through the mesh-work between the margins, all such tension wires being connected with the mesh wires by twists of the latter about the former. A fundamental feature in the machines of these patents, each and all of them, is the provision of a linear series of parallel tubes or hollow spindles suitably supported in this relation to each other, through which the tension wires, marginal and intermediate, of the fencing may pass in the process of manufacture. Another fundamental idea running through these patents is the arrangements of the mesh-wire spools alongside the hollow spindles, together with the provision, first, for rotating one or a pair of spools about each spindle, and, second, of transferring the spools from rotary position about one spindle to rotary position about another spindle, as the next one adjacent.

The provision of a series of hollow spindles or tension wire tubes, arranged in the same plane, not only enables the production of meshed wire fencing having a multiplicity of parallel tension wires, but also enables the production of fencing of any desired width. That is to say, by neglecting to supply a tension wire to the extreme spindle (one or more) of the linear series and omitting mesh
49 spools for the additional spindles, the fence will be made narrower and its width may be regulated to any extent desired within the range of the series of spindles and accompanying mesh spools provided in the machine. Similarly, tension wires may be omitted from any of the intermediate spindles, and if mesh spools be employed with the spindles from which the tension wires are omitted, a fence will be produced having marginal tension wires, but without intermediate tension wires, to the extent that such tension wires have not been threaded through the spindles. Thus a meshed fence may be made having only marginal tension wires, or such a fence may be made having tension wires through all the meshes, or a fence may be made having, beside the marginal tension wires, one, two or more intermediate tension wires with meshed spaces lacking such tension wires, and all these descriptions of fences may be made of any desired width within the range of the series of hollow spindles. All these capabilities go together and follow as a result of providing a series of hollow spindles adapted to receive a corresponding or a less number of tension wires, combined with spools for the mesh wires revoluble about the spindles and transferable from one to the next and back again.

I mentioned the coexistence of these capabilities as the result of employing a series of hollow spindles more than two in number and arranged in the same plane, as the Davisson patent shows them, because said Davisson patent mentions in terms only one of these capabilities, namely, that of making the fencing of greater or less width and with only marginal tension wires. Let it be understood, therefore, that the Davisson machine, as shown in the patent, will allow tension wires to be inserted through all of the hollow spindles at the same time as well as through any two of them, and that this is an inherent capability of the machine of that patent.

Now describing, briefly, the general features of the machine set forth in the Davisson patent, and directing attention especially to figures 3, A A are a series of parallel tubes, here shown as five in number, arranged in the same plane. For reasons belonging to this machine, each of the spindles A A requires to have a longitudinal movement as well as a rotary one. The rotary movement is provided for by a pinion *a* on each spindle, all of said pinions being simultaneously engaged by a reciprocating rack elsewhere lettered J and shown in figure 3 as having connection with the lever M through the medium of a link N. The spindle A is squared to fit a square hole in the pinion *a* to allow the longitudinal reciprocatory motion of the spindle referred to. In the working of the machine, that is, when actually forming the twists of the meshes, alternate spindles A A are lowered from the position shown in figure 3, as, for example, shown in figure 1. At the free end of each spindle is provided a square cross-head *f* and upon these cross-heads are supported the mesh spools G G. These mesh spools consist really of cylindric cases G G and interior rotary spools or reels proper, H, as will be better seen from the detail enlarged figures 8, 9 and 10. The rotation of a spindle A with mesh spools on its cross-head *f*, as shown at the middle in figure 1, or the rotation of a spindle with one spool on one end of the cross-head *f*, as shown at the sides in figure 1, twists the mesh wires about each other or about a tension wire passing through the spindle, in an obvious way. After a suitable number of twists have been made to connect the mesh wires with each other or with the tension wires, the spools are to be transferred to the disused cross-heads shown depressed in figure 1, and preparatory to such transfer of the spools the lowered spindles are raised so as to bring the cross-heads end to end in line with each as shown in figure 3. The catches which hold the spools on the cross-heads (*j* figure- 6 and 7), being also retracted, a suitable spool-shifter moves each spool off the end of the cross-head previously carrying it to the vacant end of the adjacent cross-head, and the spools which just had the arrangement shown in figure 1, for example, will next have the arrangement shown in figure 3, or *vice versa*. After the transfer of the spools the vacant cross-heads, along with their vacant spindles, are lowered out of the way.

I have not gone into minute details or made mention at all of many adjunctive devices present in this Davisson machine, because the claims 2 and 3 in suit pertain only to the leading and character-

istic devices which I have mentioned and out of which grow the characteristic capabilities of the invention.

Claims 2 and 3 read as follows:

"2. In a machine for making wire fabric, a series of spindles arranged in a line and mounted in bearings on a suitable supporting frame, and having on each spindle a cross-head carrying reels for wire on opposite sides of the axis of said spindle, substantially as specified.

51 "3. In a machine for making wire fabric, two or more hollow spindles adapted to admit the passage through their axes of wires forming the edges of the fabric, and having on each spindle a cross-head carrying reels for wire on opposite sides of the axis of said spindle, substantially as specified."

The "spindles" mentioned in line 2 of claim 2 are the hollow spindles or tubes through which the longitudinal tension wires of the fabric pass. In claim 3 the adjective "hollow" is supplied.

It will be observed that the structure described in each of these claims is characterized by the arrangement and support of the mesh spools or reels alongside and on opposite sides of the hollow spindle, also that claim 3 applies to two hollow spindles for marginal wires as well as for more than two spindles, whether the extra spindles be used only when narrower or wider fabric having only marginal wires is required, or otherwise, so long as the condition of the claim relating to the support of the mesh spools transferably alongside the spindles is observed.

Claim 3, as I understand it, calls for more than two spindles for the tension wires, the words of the claim being "a series of spindles arranged in a line." Two would always be in a line with each other, but more than two might be out of line. Hence the qualification, "in a line," taken in connection with the drawing, (showing five of these spindles in a line), means unquestionably that the claim shall apply to a series of three or more hollow spindles.

The word "bearings" found in claim 2, may, I think, apply to such support on a suitable supporting frame as will keep the hollow spindles in their proper positions in line with each other, parallel, and fit to bear or support the tension wires of the fabric at the required distance apart and in definite relation to the spools for the mesh wires which are to be wound about said tension wires.

Defendants' machine, in my judgment, clearly contains the elements and presents the conditions of both these Davisson claims in suit. It is a machine for making wire fabric, and particularly for making meshed-wire fencing, having either marginal tension wires only or tension wires intermediate to the marginal wires, and the fence fabric of either description may be made of various

52 widths. It has these same capabilities of the Davisson by reason of the essentially same mechanical elements. That is to say, it has "a series of spindles ('hollow spindles') arranged in a line and mounted in bearings on a suitable supporting frame," said hollow spindles being "adapted to admit the passage through their axes of wires forming the edges of the fabric;" and each of said hollow spindles has a cross-head or part extending both sides of the

spindle for "carrying reels for wire on opposite sides of the axes of said spindles." Defendants' machine, therefore, answers to both claims 2 and 3 of the Davisson patent.

There are obviously formal differences between defendants' machine and the machine illustrated and specifically described in the Davisson patent, but these, in my judgment, cut no figure in this comparison, which is made on the assumption that the combination stated in claims 2 and 3 of the Davisson patent are not anticipated, and that consequently said claims are not dependent upon specific formal features found in the particular embodiment of the invention illustrated in the Davisson patent drawings. Moreover, the changes made in the defendants' machine are, in my judgment, for the most part those which have been invented by Kitselman, Conner and Pope, and which are embodied in the three patents in suit granted to these persons, respectively. This being the fact, I shall have occasion to refer especially to these changes or differences in comparing defendants' machine with the patents to Kitselman, Conner and Pope and need not, therefore, particularly refer to them further in connection with the Davisson patent.

Next taking up the Kitselman patent in suit, a conspicuous departure made by Kitselman from the machine shown in the Davisson patent is found in the fact that while the Davisson is shown as a stationary and necessarily bulky or massive apparatus, the machine of the Kitselman patent is relatively small, light and compact, and, moreover, is especially designed and adapted for the construction of the fence fabric in the field. That is to say, instead of the fabric passing out of the machine and to an accumulating roller ready for shipment to the point of use, the fence, with the Kitselman machine, is to be actually built where it is to stand, and instead of the fabric moving, the machine moves along the previously
53 stretched tension wires of the fabric, step by step, and weaves in the mesh wires as it proceeds in this manner.

This purpose of making the apparatus portable and adapted for field use for the erection of fences in an upright position and where they are to remain, is very carefully elaborated in the Kitselman patent, and is, indeed, therein stated to be "the primary object I have in view in my invention" (page 1, line 15).

The change from a machine weighing, perhaps, several thousand pounds, covering a floor space of perhaps a hundred square feet and reaching upward say eight or ten feet, to one little higher than the fence to be made and, say, ten by eighteen inches in horizontal section, and adapted to be operated readily by one man, is manifestly one which is likely to involve ingenious contrivance amounting to a high order of invention in itself. On the other hand, after the machine has been changed to these portable dimensions and given this new adaptation for easy operating in the field, it is easy to make the improved machines stationary, should that at any time be required, and consequently the statement of the inventor as to its being his object "to provide a simple and easily operated machine of the class named which can be adapted for use in the open field or other place for the construction of fences," is naturally accom-

panied by the added words, "as well as a stationary or fixed machine for the manufacture of wire fabric." No other form of the Kitselman invention is shown in his patent than its portable or field form.

Adjourned until Monday morning, August 1, 1898, 10 o'clock.

CHICAGO, *August* 1, 1898—10 o'clock a. m.

Met pursuant to adjournment.
Present: Parties as before.

WITNESS (continuing):

The changes made by Kitselman from the loom form of machine made by Davisson are well defined and have direct bearing upon Kitselman's "primary" and revolutionary object of producing a machine for building the fence fabric in its upright, permanent position in the field.

First. Kitselman makes the hollow spindles for the tension wires longitudinally stationary, and thus gets rid of the apparatus employed by Davisson for moving them lengthwise; shortens
54 them and lessens the space occupied by them when made movable; avoids the necessity for the specific form of sliding bearings employed by Davisson; avoids the need for sliding movement of the spindles through their rotating pinions, and enables the pinions to be connected directly to the hollow spindles at a single point in their length.

Second. Kitselman, also, brought the ends of the hollow spindles practically opposite the points of delivery of the mesh wires from the revolving spool-carriers. On this point, it will be observed that Davisson provided his cross-heads for the support of the reels or spools at the outer and free ends of the hollow spindles and that the mesh wires were delivered from the reels H through holes in the reel or spool cases G at a considerable distance beyond the ends of the hollow spindles. An obvious fault in this Davisson arrangement is that the twisting of the mesh wires about the tension wires took place correspondingly beyond the ends of the spindles and where, consequently, the tension wires were comparatively unsupported. This could not fail to result in the drawing inward of the marginal tension wires toward each other by the mesh wires being twisted thereon and the narrowing of the fabric. Correspondingly these intermediate tension wires would be subject to lateral deflection according to the difference in strain upon the spool wires being wound about them, with the result of giving a greater or less irregularity in the formation of the meshes and, of course, in the direction of the tension wires. The Kitselman improvement in this particular produces the twists of mesh wires about the tension wires adjacent to the ends of the hollow spindles, and therefore near the points where said spindles support said tension wires. This feature of the Kitselman invention is clearly shown in figures 2, 4, 7 and 9 of the Kitselman patent drawings. The effect of this feature is further to contract the machine and is, therefore, in line with the

"primary object" of Kitselman to make the machine portable and adapted for building the fence in the field.

Third. Whereas Davisson engaged his twisting pinions with a straight rack, Kitselman directly gears said pinions to each other, and throws out the rack. The use of a straight rack to give rotary motion to the pinion involves reciprocation of the rack, and this involves means for transforming primary rotary motion to reciprocating motion. Davisson employed such transforming mechanisms and Kitselman got rid of them all and was enabled by this improvement to apply the rotary motion of a hand crank directly to the rotary gears. This, too, was evidently in the direct line of Kitselman's declared "primary object" of making a hand machine for building the fence in the field.

Fourth. Kitselman not only proposed to make the machine simple, compact, light, portable and easily operable by one person, so that the farmer who needed a fence could make it himself on his own premises, but he proposed that the farmer should be able by means of his machine to build the fence exactly where he wanted it to stay and in the upright position required for the fence. With this end in view, Kitselman arranges the hollow spindles and their accompanying twisting devices in a vertical plane, one above the other, or in a form of machine adapted to give such vertical arrangement when the machine is used in the field. In the Davisson machine the spindles are directed upwardly and the fabric passes upward therefrom to an accumulating reel overhead. In the Kitselman machine the spindles are directed horizontally, and they are supported in this position by the narrow, compact frame which stands upright.

Fifth. A machine which is to build fencing *in situ* must itself move, inasmuch as the fabric cannot, and it is as necessary that the fabric made by the movable field machine shall be symmetrical as to its meshes as that a fabric made by a stationary machine shall be such a product. But to obtain this result in a field machine is a very different proposition from that of getting the same result in a stationary or loom form of apparatus. In the latter properly actuated mechanism may draw the tension wires forward regular distances at the proper time, as the Davisson patent shows, but in the field machine the tension wires are fixed and the machine itself must be moved in this regular step-by-step way. Kitselman provided for this by mechanism operated by a hand lever and seizing ultimately upon the ground as the resistance of force, so that, by suitable adjustment of the mechanism, the operation of the hand lever after completing any one twist, would carry the machine along the stretched tension wires a definite and predetermined distance. As shown in his patent, Kitselman does this by means of a rack and pinion mechanism, combined with a ratchet on the pinion and a pawl on the hand lever, the rack being affixed to a board which is placed on the ground and becomes stationary with the latter. Later, and without departing from this fundamental principle, he substituted mechanism for grasping the stretched tension wires, which are ultimately supported from the ground through a post or other means for holding them taut. Broadly there is no

fundamental distinction between the use of the board with its rack, resting on the ground, and the tension wires connected with the ground by a post. The result of the step-by-step propelling mechanism is the production by a field apparatus of the same symmetrical fabric which, by the use of different and more complicated and bulky contrivances, was produced in the factory by Davisson.

Some of these transforming changes made by Kitselman are in terms referred to in the Kitselman claims in suit, while others are not specifically mentioned. In view of their direct relation to the transformation effected by Kitselman and in view of Kitselman's statement that such transformation is the "primary object I have in view in my invention," it seems to me they are properly to be taken into account in determining the scope and meaning of all the Kitselman claims in suit.

These claims are the first, second, ninth, tenth, eleventh, fifteenth and twentieth, which read as follows:

"1. In a wire-fabric machine, a series of sectional twisters, each of which comprises a central section for carrying a warp wire, and having rotary movement imparted thereto, and the shifting sections for carrying the weft wire, and receiving rotary motion from the central section to form the twist, substantially as and for the purpose herein described.

"2. In a wire-fabric machine, the combination of a series of sectional twisters geared together for simultaneous rotation, and each comprising a central portion movable only on its axis and side portions capable of a compound movement—that of rotation on their axes—and of a shifting longitudinal movement, substantially as described, for the purpose set forth.

"9. In a wire-fabric machine, the series of sectional twisters, comprising the central and side sections, the central section of
57 each twister being geared to the twister adjacent thereto for simultaneous operation, substantially as described, for the purpose set forth.

"10. In a wire-fabric machine, the combination of a series of twisters geared directly together for simultaneous operation, and each comprising a central section and the side sections, each side section carrying a spool or reel for the wire, substantially as described, for the purpose set forth.

"11. In a wire-fabric machine, a series of twisters connected for simultaneous operation, and each consisting of a central section and the side section, in combination with the spools carried by the side sections, the central section of each twister being provided with a longitudinal opening for the passage therethrough of the warp wire, substantially as described.

"15. In a wire-fabric machine, the combination of a series of rotary twisters geared directly together for simultaneous operation, each twister having a central section capable of rotary movement only, and two side sections which are capable of a shifting movement independently of the central section in opposite directions simultaneously, whereby the said shifting sections of one twister are adjusted to register with the central sections of twisters on opposite

sides of the same, substantially as described, for the purpose set forth.

"20. In a wire-fabric machine, a series of sectional twisters, each comprising a central section, the central sections being geared together to be simultaneously rotated on their axes, and the shifting side sections adapted to align with the central sections to be rotated therewith, substantially as described, for the purpose set forth."

It will be observed from these claims that Kitselman embraces in the term "twister" three general parts, one of which includes the hollow spindle, and each of the others of which includes a detachable and transferable spool-carrier and a spool for a mesh wire mounted rotatably on said carrier. The first of these sections he calls "central sections" of the twister and the other two the "shifting sections." In each of the claims in suit, it is specified that there shall be "a series" of these three section twisters, and, by implication, I think the central and driving sections of all these
58 twisters are longitudinally stationary, in distinction from the longitudinally movable twisters of the Davisson patent, so that all the twisters in the series, including the detachable spool sections thereof, are at all times maintained in their same longitudinal position. The side sections are given their rotary motion by the rotating central sections, the intermeshed driving gears being connected with the central sections only and the side sections being so conformed to the central sections that, upon rotation of the latter, the side sections carrying the mesh spools are revolved to form the twists. In this particular embodiment of the Kitselman invention the hollow spindles themselves revolve along with the gears and, to communicate revolution to the side sections of the twister, said spindle is provided with parallel-sided, laterally projecting arms, against which the straight inner faces of the side sections bear. Externally, the side sections at their ends are given parti-circular form, so that when standing alongside the central section, the three together have a circular boundary. Vertically sliding strips are provided in the frame, having parti-circular recesses which fit the curved edges of the side sections so as to confine the three sections together and, when so confined, the rotation of the central section by its connected pinion or gear-wheel involves the rotation or revolution of the side sections with it in the confining recesses of the sliding frame pieces referred to. After a twist of the mesh wires about the tension wires, the movement of one of the sliding frame pieces upward and of the other of said frame pieces downward, carries the two side sections of the twister into connection, one with the superjacent and the other with the subjacent, central section and spindle of the apparatus, preparatory to a similar twisting of the mesh wires about the neighboring tension wires. The machine is, of course, advanced along the tension wires between the twisting operations, and the same side sections of the twisters are alternately brought back into operative engagement with the central sections with which they were previously engaged. In all cases the rotary power is ap-

plied to the central sections of the twister and is communicated therefrom to the detachable and shifting side sections.

As will be observed (especially from figure 4), and as stated in the patent, the central section of each twister of the vertical series is supported only at its inner end and its outer end is free. Also, the pinion for driving each central section is rigidly fastened to
59 the shaft by which said central section is supported and rotated. The pinions of all the twisters being thus secured and directly geared to each other, the rotation of any one of them gives rotation of all, and alternate twisters necessarily rotate in opposite directions. In the drawings, a hand crank is shown at convenient height from the ground, having on its shaft a beveled pinion engaged with a beveled spur on one of the twister shafts by which motion is communicated to all the twisters simultaneously.

It is to be understood that at the top and bottom of the machine there will be a rotary central section of a twister which will receive one spool-carrier only for the application of a mesh wire to the top and bottom marginal wires of the fabric, and that this spool will be present and rotate with said central portion only when the mesh wire is to be carried about said marginal wire, while at other times, or, in other words, when said mesh wire is to be carried about the next inner tension wire or twisted with the next inner mesh wire, the upper or lower central section of the twister will revolve empty of a spool. It will also be understood that, as in the Davisson machine, any two of the twisters may carry the marginal tension wires and that spools may be omitted from those above or below, and also, as the Kitselman patent illustrates and describes, spools may be applied in pairs to all the intermediate twisters or to alternate ones in making different varities of fabric. The spools being detachable, various changes in the mode of using the machine for the production of different styles of fabric, may be made.

Defendants' machine, in my judgment, contains the inventions of the Kitselman patent recited in the above-enumerated claims, as well as the inventions of the Davisson patent, as already pointed out.

Defendants' machine is a hand-operated field machine which, in my judgment, could not have been made as a departure from the Davisson machine without the adoption of the Kitselman ideas and inventions, and in my opinion it contains said ideas and inventions of Kitselman specifically, as to their essentials. It differs therefrom only in form and by the embodiment of additional inventions mainly set forth in the Conner and Pope patents here in suit. There is no departure therein from the essential principles of the Kitselman invention as recited in the claims in suit, in any particular.

60 In defendants' machine the twisters, including the series of hollow spindles, are arranged in a vertical line with each other and are supported by a suitable upright frame. Each of the twisters is composed of three parts or sections, the central section of which is stationary longitudinally, and as to its position, but which is rotatable upon its axis, at least as to so much of it as needs to

rotate. Each of these rotatable central sections contains, or has connected therewith, a pinion which is directly meshed with the corresponding pinion of the adjacent sections. Each of the twisters, or as many of them as it may be desired to use, is provided with detachable and shifting sections each composed of a spool-carrying frame or part and a rotatable spool for a mesh wire. All the twisters used at any time are simultaneously revolved by a single hand crank placed in the position shown in the Kitselman patent and geared to one of the twisters. The spool-carriers of each twister are outwardly flush or substantially flush with the free ends of the spindles so that the twisting of the mesh wires about the tension wires which extend through said spindles is performed adjacent to the points where the spindles support the tension wires at their proper distances apart. The machine, being an embodiment of these improvements by Kitselman, has the general proportions, the lightness, compactness, portability and the easy manageability of the Kitselman, and it is correspondingly provided with means for giving it a regular step-by-step movement between the operations of twisting so as to give to the upright fabric which it forms in the field the regularity and symmetry of the factory-made fabric, as accomplished by Kitselman's machine. The propelling mechanism of defendants' machine takes hold of the stretched tension wires instead of taking hold of a rack upon a ground plank, as I understand Kitselman did in his own machine long prior to the construction of defendants' apparatus.

It is not material in my judgment, that defendants' machine presents formal differences from that illustrated and specifically described in the Kitselman patent. For example, it is not material that the side or shifting sections of the twisters in defendants' machine are held to the rotary central section (so as to derive motion therefrom), by other means than the recessed, vertically sliding frame pieces shown in the Kitselman patent, because none of the claims selected from the Kitselman patent for this suit em-
61 braces said sliding frame pieces as elements or is dependent upon them. Nor is it material, in my judgment, that the shifting sections of the twisters are transferred from one twister to another by other means than said sliding-frame pieces. The Kitselman claims in suit are generic in their terms relating to these and similar matters. For example, in claim 1 the side transferable sections are referred to solely as "the shifting sections for carrying the weft wire and receiving rotary motion from the central sections to form the twist." In claim 2 they are referred to as "side portions capable of a compound move-nt—that of rotation on their axes—and of a shifting longitudinal movement (meaning up-and-down movement)." In claim 9 they are referred to solely as "side sections." In claim 10 they are mentioned as "side sections, each side section carrying a spool or reel for the wires." In claim 11 the side sections are referred to as a part of the twister and as carrying a spool. In claim 15 the shifting sections are spoken of only as "two side sections which are capable of a shifting movement independently of the central sections, in opposite directions simultaneous, whereby the said shifting sections of one twister are adjusted to

register with the central sections of twisters on opposite sides of the same," and in claim 20 they are spoken of as "the shifting side sections adapted to align with the central sections to be rotated therewith." Defendants' machine answers to all these conditions of all the claims in suit relative to the shifting spool-carrying sections of the twister.

Nor is it material, in my judgment, that a part of the central section in defendants' machine, to wit, the part called the hollow spindle and forming the wall of the hole through which a tension wire may pass, does not itself rotate, as shown in the Kitselman patent. The essential thing in this spindle is that it is a walled hole, and it is immaterial to the hole whether the wall rotates or not. It is an advantage to the fence and to the ease of operating the machine that the wall of the hole shall not rotate, as Pope discovered and sets forth in his patent in suit. But it is not material to the carrying of the side or shifting sections of the twisters, or to their shifting action, or to their revolution about the spindles, or to the performance of any of the functions or to the perfection of any of the combinations specified in the Kitselman claims in suit, that the hollow spindles themselves shall rotate, and hence, in my judgment, defendants' machine does not escape the Kitselman
62 claims sued on by reason of the non-rotation of the spindle itself. In the Kitselman construction, it is not merely the rotation of the spindle that causes the rotation of the shifting sections of the twisters, but it is the rotation of laterally projecting parts attached to the spindle. To disconnect these parts and to rotate them alone while leaving the spindle non-rotatable, would give precisely the same results, so far as the carrying, the revolution and the shifting, of the shifting sections of the twister are concerned.

Hence, understanding the words, "substantially as described, for the purpose set forth" of the claims to have reference to the purposes broadly stated in the patent and by which the Kitselman machine is distinguished from the Davisson as a producer of the same kind of fencing fabric, defendants' machine responds clearly and completely to each of the above-enumerated claims of the Kitselman patent.

Next, taking up the Conner patent in suit, I first point out that this patent shows a machine arranged as a loom for stationary or factory purposes. It has the series of hollow spindles arranged in line with each other, as in the Kitselman and Davisson machines of prior date, but it has these spindles arranged in a horizontal plane, instead of in a vertical one and directed upwardly, as in the Davisson. The invention of the Conner patent relates primarily to the mechanical handling of the shifting spool-carriers accompanying the spindles, in the operation of the machine. All the capabilities as to variety in the width and weave of the product set forth by Conner are the same as those of the Davisson patent and are due to the same reason, to wit, the employment of a series or multiplicity of hollow spindles arranged in the same plane, combined with shiftable mesh-wire spools, which in the operation of the machine are transferred from one twister to another and back again, to make

the successive meshes. The gear wheels of the twisters are meshed directly with each other, as in the Kitselman patent, so that the machine is capable of being driven by a continuous rotary motion. The spool-carriers applied to either of the twisters and forming what Kitselman calls the "side sections" or the "shifting sections" of the twisters, are flush, practically, with the ends of the hollow spindles, so that the machine has this feature also of the Kitselman invention. What Conner did of importance was to introduce automatic means
63 for shifting the side or shifting sections of the twisters from one twister to another, at proper intervals. This he does by means of what he terms "switches." In the first place, he supports the side sections or spool-carrying frames of the twisters at a suitable distance from the hollow spindle by means of disks attached to the spindle, said disks being located one at each end of the spindle and being provided each with marginal notches in which may rest projections or bearings on the spool-carrier frame. The spool-carrying frames are held in these notches during the revolution of the twisters by outside bearings confining them there, portions of said outside bearings being movable and adapted to change the course of a spool frame from a path around one of the spindles to a path around the next adjacent spindle. That is to say, when the spools are brought into line with each other and with the spindle, the spool-carrier frames rest in both the notches of the disks belonging to adjacent twisters, and, according to the position of the movable part of the confining surface referred to, said spool-carrier frame will proceed from this point in the notches of the disk by which it was brought to this point, or it may be made to leave this point in the notches of the adjacent disks and thus travel around the spindle of the adjacent twister. As the patent puts it (page 2, line 84), "This gives to each spool-carrier a travel in the path of a figure 8, the adjacent disks crossing each other's path at each revolution, and thereby forming the net or loop in the wire, and afterwards producing a twist at such point, having as many turns as the spools make distinct revolutions after the wires cross."

The introduction of automatic "switches," so called, enables the machine to be operated exclusively by means of the driving power which rotates the switch. In other words, the automatic switches dispense with hand-operated means for shifting the side sections of the twisters from one twister to another and back again. The operator has, therefore, only to manipulate his driving crank to accomplish the whole work of twisting and of shifting the shiftable sections of the twisters. Of course, in the field machine he has still to perform the work of moving the machine along over the ground at the proper intervals.

64 Claims 2 and 3 of this Conner patent read as follows:

"2. The combination, with a train of intermeshing gears arranged in line, each gear having a hollow shaft, of notched spool-carrier disks mounted on said hollow shafts, bobbin frames mounted in said notched disks, and automatic switches by which the bobbin frames are simultaneously withdrawn from the notches of those

disks having similar rotation and lodged in the notches of the adjacent oppositely revolving disks, substantially as described.

"3. The combination, with a train of intermeshing gears of equal diameter, mounted on prolonged hollow shafts arranged in line, of a corresponding serries of spool-carriers mounted on said hollow shafts and having notched disks, bobbin frames having journals lying in the notches of said disks, and switches by which the bobbin frames are each withdrawn from the notches in one pair of disks and lodged in the notches of the adjacent oppositely revolving pair of disks, substantially as described."

What are called "bobbin frames" in these claims are what I have called spool-carriers, spool frames or reel frames heretofore. The "intermeshing gears" are the immediate driving gears of the twisters. The term "spool-carriers" is differently used in these claims and in the specifications and differs from the use I have made of it, said term being applied in said claims to the supports on the spindles by which the "bobbin frames" (heretofore denominated spool-carriers or spool frames by me and sometimes called "spool-carriers" in the Conner specification) are held out at a proper distance from the spindle and, as to their forward ends, supported against the inward strain or pull of the mesh wires in the twisting operation, that is to say, what are called "spool-carriers" in the claims are said to be mounted on said hollow shaft and to have notched disks, already explained as forming the support of what I have called the spool-carriers or spool frames and what the claims of this patent term the "bobbin frame."

With this explanation, it will be apparent that defendants' machine contains the subject-matter of claims 2 and 3 above quoted from the Conner patent. In other words, defendants' machine has "a train of intermeshing gears, arranged in line," and for each gear "a hollow shaft forming the axis of the gear." In defendants' machine there are also two notched, spool supporting or carrying disks, one of them mounted on the spindle or hollow shaft adjacent to the gear and the other transferred from the hollow shaft to the bobbin frame. That is to say, instead of putting a notched disk on each end of the hollow shaft or spindle, defendants have put one such notched disk on their hollow shaft at its base and adjacent to the gear, and have put the other on the outer end of each bobbin frame. Of course, it is entirely immaterial to the accomplishment of the end in view whether the hollow shaft or spindle holds the bobbin frame parallel therewith and at a proper distance therefrom by something attached to the spindle and bearing against the spool frame, or by something attached to the spool frame and bearing against the spindle. The very presence of one of these at one end of the spool frame or spindle and of the other at the other end, shows their perfect interchangeability and their substantial identity for the purpose stated. Defendants' machine, therefore, in my opinion, contains the element expressed in the Conner claims by the words "notched disks," or by the words "spool-carriers mounted on said hollow shaft and having notched disks," or by the words "notched spool-carrier disks mounted on

said hollow shafts." In part, defendants' construction is identical with that of the Conner patent, and for the rest it has the equivalent.

Defendants' machine also has an automatic transfer of the bobbin frame from one twister to another, so that said bobbin frames "are simultaneously withdrawn from the notches" of the disks by which they are held in one twister and lodged in the notches" of the disk of the adjacent twister by which they are similarly held and carried round.

The means by which this automatic transferring or shifting is accomplished in defendants' machine are formally different from those shown in the Conner patent, but they effect the same result, and I know of no restriction upon the word "switch" which stands in the way of its application to defendants' device for this purpose, as much as to the device of the Conner patent for the same purpose.

66 In the Conner patent, figure 1 shows the so-called switches (at 19) in their relation to the projections 13 on the bobbin frame as the latter are seen to rest in the notches of the disks 7 belonging to the several twisters. These so-called switches 19 are the extremities of centrally pivoted levers which are vibrated by the rods 20, 20*a*, through a connection 21, and other details of mechanism connected with the driving machinery. When the disks and bobbin frames are out of the position in which they are shown in figure 1 the switches 19 are vibrated from one of their positions to the other, (at the other side of the path of the bobbin frame), so that when the bobbin frames next come around to the position shown in said figure 1 and move onward from said position, they leave the notches of the disks 7 in which they were formerly retained and proceed in the corresponding notches of the adjacent disks 7, as already stated.

In defendants' machine, the bobbin frame is provided at its inner end with a somewhat broad flange projecting from all sides of the axis of the bobbin frame, said flange or base plate being adapted to enter, for a part of its length the flat space between the notched disk on the hollow shaft and the adjacent gear of said shaft. By this means the bobbin frame is held up at its outer end. The flange or base plate of the bobbin frame is also provided on its bottom face with two substantially parallel curved grooves, into one or the other of which passes a pin or tongue or stud which stands out from the gear. On the opposite side of the flange of the bobbin frame are two shoulders (in this particular case represented as the inner end of notches or curved grooves), the surface of the flanges leading to these shoulders being beveled or inclined. These inclined surfaces and shoulders engage with spring-pressed pins mounted in the notched plate and projecting inwardly towards the adjacent gear or pinion. The bobbin frame is held to the gear and notched plate by the insertion (in the operation of the machine) of the flange on the bobbin frame between said gear and notched plate in such manner that the stud or tongue enters the groove on the bottom or rear face of the bobbin-frame flange while the spring pin rides up the incline on the outer face of said flange until it drops over the shoulder re-

ferred to. The spring pin holds the bobbin frame in place against removal in one direction, but permits it to move in the opposite direction. Whenever a bobbin frame comes between two adjacent spindles, said bobbin frames will be equally inserted in each
67 of said adjacent twisters, and it can be transferred from that to which it had previously been attached in one twisting operation to the next twister for another such operation by reversing the movement of the crank. In other words, when the bobbin frames are in line with the spindles and all the spring pins have engaged with the shoulders in the bobbin-frame basis, the said bobbin frames may be transferred to adjacent twisters by reversing the direction of rotation of the hand crank.

A difference between the exact construction shown in the Conner patent and that present in defendants' machine is apparent in that, in the machine of the Conner patent, the rotation of the gears and twisters may continue in the same direction, while in defendants' machine the automatic switching or transferring action is accomplished only by the reversal of the motion of the hand crank. I do not think that this difference relieves defendants' machine from subjection to the claims sued on in the Conner patent, because in both cases the same general object is effected and the same advantage obtained. That is to say, sliding frames for shifting the sections are dispensed with in the structure, and the labor of operating such shifting frames is dispensed with in the manipulation of the machine. In both cases, the operator has nothing to deal with but the crank, and while it is true he deals with the crank in the Conner construction by giving it continuous rotation in one direction, and in defendants' machine by reversing the direction of motion at intervals, the shifting is nevertheless equally automatic in both cases and the employment and operation of a previously used contrivance is dispensed with.

I notice that the concluding words of each of the claims say that the bobbin frames are "withdrawn from the notches of those disks having similar rotation and lodged in the notches of the oppositely revolving disks." I understand this to mean, first, a recognition of the fact that in the machine having its gears directly intermeshed with each other, alternate twisters revolve in opposite directions, no matter which way either of them may revolve. This is equally true of defendants' machine and the machine of the Conner patent. It is a fact, however, that when the direction of motion is reversed in either machine those disks which before revolved in one direction now revolve in the other, and it follows that in defendants' machine, the bobbin frames are transferred from disks or twisters which
68 formerly revolved in the same direction that is now given to the disks or twisters to which the bobbins are transferred. If this precise construction were had in mind by Conner, he would, possibly, by the terms quoted, have arbitrarily cut defendants' machine out from under the claims; but it is evident that he merely intended to say that the bobbin frame is transferred to the next adjacent twister which may otherwise be described as one having an opposite direction of motion.

Wherefore, in my judgment, and notwithstanding the formal dif-

ferences which I have pointed out between defendants' machine and the Conner illustrated construction, said defendants' machine embodies the invention of automatic transfer of the bobbin frames set forth in said Conner patent and specified in claims 2 and 3 thereof.

Adjourned to tomorrow morning at 10 o'clock.

CHICAGO, *August* 2, 1898—10 o'clock a. m.

Met pursuant to adjournment.
Present: Parties as before.

The WITNESS (continuing): Finally taking up the Pope patent in suit, it will be observed that this patent illustrates improvements in the Kitselman or field type of machine. Looking upon the Pope as more directly an advance from the standpoint of Kitselman, the principal Pope improvements are two in number. One of these consists in making the hollow spindles themselves non-rotative, while the intermeshing train of pinion gears rotate about the axes of the spindles in order to revolve the mesh spools.

This improvement is directly related to the field form of machine and in this relation is of much greater importance than might at first appear. In the first place, this improvement contributes materially to the ease with which the machine may be operated, which is a consideration of great importance when the operation is to be effected by the hand of the same person. This result arises from the fact that the long tension wires which pass through the spindles, tend, by reason of their length and weight, to sag and bear heavily upon the inner surfaces of the spindles. If the spindles rotate the friction of such heavy bearing is added to the labor of the operator.
69 On the front side of the machine this friction is increased by the strain of the mesh wires upon the tension wires in the operation of twisting, tending to draw the marginal wires inward and the intermediate tension wires up or down as the tension of the mesh wires may vary. Hence the making of the spindles non-rotative manifestly contributes to the ease with which the machine may be operated.

Another important advantage of the non-rotative spindle relates to the fact that fence wire is protected against corrosion by exposure to the elements by being coated or "galvanized," as it is termed. The rotation of the spindles about these galvanized tension wires is liable to rub away the coating in spots and thus expose it to rusting, while the non-rotation of the spindles obviates this objection.

The other of the two principal improvements made by Pope consists in providing for the detachable attachment of the spool-carriers or bobbin frames directly to the series of pinions or intermeshed gears which revolve severally about the spindles. For this purpose Pope brings forward the front faces of the pinion (inside the gear teeth) and provides said front faces of the gears — parallel T-shaped or dove-tailed grooves, one on each side of the axis or spindle, each of said grooves receiving a T-shaped or other suitably formed tongue or projection on the inner end of a spool frame. The spool frame

inserted in these grooves of the pinions are, therefore, held up at their outer free end solely by their connections with the gears.

As a means of shifting the spools from twister to twister and holding them during the operation of twisting, Pope employs essentially the devices of the Kitselman patent, to wit, vertically sliding bars, movable on the main frame and suitably engaged with the shifting sections of the twisters, said sliding frame pieces being moved by a hand lever, as in Kitselman, and not automatically or by operation of the driving crank, as in the Conner patent.

The claims of the Pope patent here sued on are the 1st, 9th and 10th, and read as follows:

"1. In a wire-fabric machine, the upright frame piece having a series of regularly spaced openings, stationary elongated warp-wire tubes fitted at one end in said openings, a vertically aligned
70 series of intergeared twister wheels loosely journaled on said stationary tubes and having parallel face grooves, shiftable spool-carriers having tongues registering with the grooves in said wheels, and shifting devices for sliding the spool-carriers from one wheel to the other, substantially as set forth.

"9. In a wire-fabric machine, the upright frame having openings, stationary warp-wire tubes secured to said frame and aligning with the openings therein, a series of aligned twister wheels loosely journaled on said stationary tubes, and shiftable spool-carriers mounted to slide on said wheels, substantially as set forth.

"10. In a wire-fabric machine, the upright frame having openings, stationary warp-wire tubes fitted at one end in said openings, a series of aligned twister wheels loosely journaled on said stationary tubes, and shiftable spool-carriers having a sliding tongue and groove connection with the twister wheels, substantially as set forth."

Referring to claim 1, the "upright frame piece having a series of regularly spaced openings," which forms the first element of the claim, is the main frame upright, and the openings therein are the holes through said uprights into which are thrust and secured the rear end of the spindle tubes. Figure 3 of the Pope drawing is a section clearly showing the upright A provided with a horizontal hole D through it into which hole is firmly screw-threaded the spindle E. Said spindle, thus secured to the upright frame piece A is non-rotative and affords an axle or journal on which the gear G is journaled to rotate, said gear being held inward to its place by a shoulder on the spindle E. The spindles are called in the claim "stationary, elongated, warp-wire tubes fitted at one end in said openings," namely, the holes in the upright frame. The "intergeared twister wheels loosely journaled on said stationary tubes and having parallel face grooves" of the claim are the series of intergeared wheels G shown in section in figure 3 and in front and edge views in figure 4. A detached "shiftable spool-carrier" is shown in figure 5, M being its tongue or flanged projection fitting one of the grooves of a wheel and holding the carrier in a horizontal position by its base attachment to the gear wheel. The last-men-
71 tioned element of the claim is "shifting devices for sliding the spool-carriers from one wheel to the other." The generic

expression of this element, taken in connection with the fact that the Pope patent follows the Davisson, the Kitselman and the Conner with their three different forms of "shifting devices," indicates to my mind an intention to be unrestricted to the particular form of shifting devices shown by Pope in his drawings. Any of the older and different forms of shifting devices answer the claim as well.

Claim 9 calls for no comment except that it is to be noted that shifting devices are not mentioned as an element of said claim, but the shifting is referred to solely by the terms "shiftable spool-carriers mounted to slide on said wheels," referring to the recessed gear wheels.

In claim 10 the shiftable spool-carriers are said to have "a sliding tongue-and-groove connection with twister wheels," terms so broad as to be applicable to any form of interengaging recesses and projections by which the twister wheel shall directly uphold the spool frames.

In this understanding of these claims, I regard defendants' machine as clearly falling within them all. Defendants' machine has the upright frame piece provided with "a series of regularly spaced openings;" it has the "stationary, (non-rotatable), elongated warp-wire tubes" or spindles "fitted at one end in said opening" in the frame; it has the "vertically aligned series of intergeared twister wheels loosely journaled on said stationary tubes" or spindles. It does not literally have grooves in the face or actual front surface of the twister wheel, but it has spaces answering in kind to the undercut portion of the grooves shown in the drawings of the Pope patent, and the shiftable spool-carriers have base flanges, each answering to the T-shaped flange M of the Pope spool-carrier, which enter these recesses in the twister wheels so as to give support to the spool from its basic and direct attachment to the twister wheel, as in the Pope patent. Moreover, the spool-carriers of defendants' machine "*slide*" "from one wheel to the other," which is the form of movement expressed in the claim and performed in the Pope device. Defendants' machine also has "shifting devices for sliding the spool-carrier from one wheel to the other," said "shifting devices" having certain features of novelty in details of construction, but embodying the general automatic principle of the Conner patent, as hereinbefore explained.

72 Notwithstanding the recognized differences in construction between defendants' machine and that shown in the Pope patent, said defendants' machine embodies the broad ideas and features invented by Pope and consisting in the non-rotative hollow spindles and in the support of the spool frame directly upon the gear wheels, by entering and sliding engagement which permits the transfer of the spool from one wheel to the other, essentially as Pope provides. Hence defendants' machine, in my opinion, falls under claim 1 of the Pope patent, if the latter be given such fair interpretation as it seems to me entitled to receive.

Defendants' machine clearly, fully and easily complies with the terms and spirit of claim 9, which reads as readily and appropriately to said machine as it does to the form of the invention illustrated

by Pope in his patent. Defendants' machine also conforms to claim 10, the sidewise-projecting base flange on defendants' spool-carrier frame answering essentially to the flange or T-shaped tongue on the base of Pope's spool frame, the recess to receive this flange answering to the corresponding recess of the Pope twister wheel and the movement for engagement and disengagement of the parts being in both cases a sliding one in the plane of the twister wheels. Hence, in my opinion, the defendants' machine contains the subject-matter of all three of the enumerated claims of the Pope patent, to wit, numbers 1, 9 and 10.

Q. 8. What is your opinion as to whether the inventions described in these four patents, respectively, and particularly included in the several claims thereof to which you have been referred, are practically and successfully operative?

A. They are practically and successfully operative, they are operative together and they constitute progressively operative developements of great practical utility and value in the manufacture of meshed wire fencing.

Cross-examination by Mr. BANNING:

X Q. 9. When and where was it that you saw the Kitselman machines offered in evidence as 1, 2 and 3 in the actual construction of fence in the field?

A. Last week, at Ridgeville, Indiana.

73 X Q. 10. Were the machines operated for the purpose of exhibiting them to you, or were they in use by some customer?

A. They were set up for illustrative operations out-of-doors and upon the ground for my own inspection, operation and study. They were severally operated by one of the other gentlemen present, and by myself. Let it be understood that I had previously examined one of these machines in operation in this office, where it is set up at the present time in connection with posts supporting the tension wires and illustrates all the conditions of fence-making therewith, excepting that incident to working over the uneven surface of actual ground and the longer stretch of tension wires to be embodied in the fence. Also that I had previously examined one of these machines in the hands of a farmer and user, together with the fence made by it, the machine, however, not being at that moment in use.

X Q. 11. At the time you saw these machines operated at Ridgeville, Ind., was the defendants' machine also operated?

A. It was, and I also operated that myself.

X Q. 12. What size wire was used in the operation of these machines and in the fence which you say you saw built?

A. No. 12 wire, I think, or possibly No. 11, for the tension wires; I am not certain which. In one case the mesh wires were of the same size as the tension wires, being exceptionally large for the mesh wires, which are usually smaller than the tension wires.

X Q. 13. Where the mesh wires were of the same size as the tension wires, what size for both was used?

A. My recollection is, No. 12.

X Q. 14. How many strands of tension wire were used on that occasion? How wide a fabric was made?

A. Full width of ordinary fencing in all cases, and I think in one case the fence was somewhat higher than the ordinary. I should say that there were nine or ten tension wires and perhaps more. Certainly not less than eight or nine in any case.

X Q. 15. About how high in feet was the fence?

A. I should say the top of the fabric was about four feet from the ground, or four feet and a half.

74 X Q. 16. How long were the meshes in this case where the mesh wire was of the same size as the tension wires?

A. From angle to angle perhaps about eight inches, or say double the distance between the tension wires. On the assumption that the exhibit machines are of the same dimensions as to spacing between the spindles (and I think they are made from the same pattern), this matter can be determined by measurement of the machine present, if counsel will furnish me with a rule. I find by applying a rule to Kitselman machine No. 1 that the spindle holes are four inches apart. This gives to each mesh of the mesh wires a height between vertical angles of eight inches. The horizontal distance between the angles of the meshes may be varied by varying the propelling feed of the machine along the ground between twists. I think the meshes in the case referred to were about as long horizontally as vertically, though I took no measurements and can only speak from a general impression made by the product upon my mind at the time. With some of the machines, and it may be with the one referred to, variations in the horizontal dimensions of the meshes were actually produced by moving the machine along greater or less distances on the plank supporting it.

X Q. 17. How was the machine advanced in the case where you say the mesh wires were of the same size as the tension wires? and how was the mechanism shifted from one tension wire to another in the operation of the machine?

A. I do not now definitely identify the fence in which all the wires were of the same size with the particular machine by which it was made. The machine corresponding with Complainants' Exhibits Kitselman Machines Nos. 1, 2 and 3 had the same propelling devices present in these exhibits severally.

X Q. 18. Was it a machine like the complainants' or like the defendants' that you saw operated with uniformly size wires for the tension and mesh wires?

A. It was one of complainants' machines.

X Q. 19. Do you remember what propelling device was used on that machine? Was it one that advanced the machine by the rack and pinion on the base plank, or one that drew it forward by pulling on the tension wires?

75 A. The question resolves itself into this: Was the propelling mechanism like that on the Kitselman machine No. 1 or like that on the Kitselman machine No. 3? I cannot answer positively from recollection, having made no note whatever of this matter,

but, giving my impression, I would say that particular fence was being made by a machine corresponding with the Kitselman No. 3, wherein the propelling mechanism engages the tension wires.

X Q. 20. I notice in this Kitselman machine No. 1 that the fabric partially woven is only about one-half the width of the fabric which the machine is capable of weaving. Why is this?

A. So far as I know why, the seven tension wires and the appropriate number of spools are amply sufficient for the study of the operation of the machine, such study being the purpose of having said machine set up here as it is, threaded for use.

X Q. 21. Is not the difficulty of advancing the machine and of shifting the spools from one tension wire to another increased in proportion to the number used and the width of the fabric woven?

A. Certainly. It must be remembered, however, that fences are often made as low or lower than that being produced in the Exhibit No. 1. I have seen what is called hog fence, which, as made by complainants, has a barbed wire at bottom for the lowermost tension wire and either a similar wire or a plain one at the top, in which there are only six tension wires altogether. This exhibit has seven threaded through the machine.

X Q. 22. This Kitselman machine No. 1 appears to have a fabric in it of only one-half the width that it is capable of weaving. If the fabric were made the full width provided for in this machine and the mesh wires were of the size shown in this exhibit, how could the spools be shifted from one spindle to another?

A. In the same manner that it would be done now, but with the exertion of greater power.

X Q. 23. Do you think that it would be practical with that Kitselman machine No. 1 for one man to weave a fabric the full width provided for in that machine with the mesh wires of the size shown in the exhibit before us?

76 A. From my trial of this machine, I should say that one man could do it easily.

X Q. 24. Where the mesh wires were used of the same size as the tension wires, as you have explained, how were the spools shifted from one spindle to another?

A. Whichever that machine was (I stated that I do not definitely recall which it was), they were shifted precisely as the machine is intended to be operated, and as it would be operated if the spool wires were lighter. I am not a strong man or accustomed to physical exertion, but I so operated the machine.

X Q. 25. Do you make any distinction between stationary machines and portable machines, so far as the fabric-weaving devices and appliances are concerned?

A. As to the individual devices or parts entering into the fabric-forming mechanism, and assuming them to be capable of making the same fabric, I would not; but as to the organization of these elements and their co-ordination and arrangement or combination with each other and with parts for their operation, I would. There is, in my judgment, the widest possible distinction to be observed between this Kitselman machine No. 1, which, so far as I am aware,

is the first field machine for making meshed wire fences *in situ*, and the loom machine of Davisson for making the same fabric and putting it into rolls in a factory. Yet the Kitselman machine contains many of the individual elements or parts found in the Davisson machine for forming this fabric.

X Q. 26. To be more specific in my inquiry, I will ask whether you make any distinction between stationary machines and portable machines, so far as the use and operation of the mechanism described in the various claims discussed by you in your direct examination and taken from the several patents sued on are concerned?

A. I don't know that I exactly catch counsel's meaning, but, as I understand the question, I reply that in the Kitselman patent for the first field machine known for making this fabric I attach greater significance to those contrivances or features introduced by him for the production of the first field machine for this purpose than I would attach to features adapted to such a machine, introduced later. The foundation, so to speak, of the art were broadened out by Kitselman to include both field and factory machines, while before it only included the factory or loom type. After Kitselman, inventors would be entitled to special merit only as their invention might be especially advantageous in one only of these types of machines. For example, Pope's invention, consisting in part in dividing the rotary central element of the twister so as to allow the spindle to remain stationary or without rotation while continuing the rotatability of the spool-carrier supporting portion along with the adjacent gear, was an improvement which, so far as I can see, would have no material merit whatever in a loom or factory machine. Its advantages are conspicuously associated with the field machine, and his claims pertaining to this matter, in my judgment, derive dignity and force as being for improvements in the field apparatus which Kitselman added to the art. On the other hand, there are improvements, such, for example, as Conner made, which are equally applicable to, and perhaps equally advantageous in, both types of machine, and I would therefore make no distinction between these types in considering these improvements or others of that nature.

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X Q. 27. The Davisson and Conner patents sued on show and describe stationary machines, and the Kitselman and Pope patents sued on show and describe portable machines. Is not this correct?

A. It is.

X Q. 28. As I understand you, you do not consider that the combinations called for in the second and third claims of the Davisson patent and in the second and third claims of the Conner patent are confined to stationary machines. Is this correct?

A. That is true.

X Q. 29. Would you in like manner consider that the combination described in the first, second, ninth, tenth, eleventh, fifteenth and twentieth claims of the Kitselman patent and in the first, ninth and tenth claims of the Pope patent were not confined to portable machines, so that a person using them in stationary machines would not be at liberty to do so?

A. The claims referred to of the Kitselman and Pope patents are not restricted to portable machines. The Kitselman patent,
78 at least, expressly provides in the specification that while the "primary object" of the invention is to make a field machine, the inventions therein specified are applicable to stationary machines. And this is not inconsistent with what I have said in previous answers relative to the special dignity and significance belonging to the Kitselman invention by reason of their resulting in a wholly new type of machine (the field type) for making a particular form of fencing fabric, nor is it inconsistent with what I have later said as to the special merit of one of Pope's improvements as having its more valuable advantages in a hand-operated field machine.

I notice by reference to Pope's patent that it says:

"This invention relates to wire-fabric machines; and it has for its object to provide certain improvements in machines of this character which are specially adapted for moving along in a straight line, during work, for the purpose of weaving a line of woven-wire fencing."

While his said improvement has its greatest utility in this one of the two existing types of machines, I know of no reason why his claims for said improvement will not hold against a stationary machine provided with it.

X Q. 30. As I understand the Davisson and Conner patents sued on, they are intended to be operated by power as contradistinguished from manual means for operating them, and that the Kitselman and Pope patents are intended to be operated by hand, as contradistinguished from power in its usual acceptation. In short, that two of them are power machines and two of them hand machines. Do you also so understand them?

A. I do.

X Q. 31. Do you make any distinction between the power that may be applied for the operation of the mechanism called for in the various claims discussed by you in your direct examination, so that the combinations called for in the claims of the patents showing power are confined to uses where power is applied to them and the combinations described in the claims of the patents where they are operated by hand are confined to use by hand?

79 A. I do not. The Kitselman machine having been produced with its adaptations for operating by hand, may, as the patent expressly provides, or, at least, implies, be a stationary machine and be run by power.

X Q. 32. To sum up, then, the essentials of the mechanisms described and claimed in the various claims discussed in your direct examination are not dependent upon the accidental circumstance of their being embodied in either a stationary or portable machine, or in a power or hand machine. Is not this your opinion and understanding?

A. With a single qualification, that is broadly true. The qualification is that, as to Kitselman, there was nothing in any sense accidental in his machine turning out to be a portable field machine

operable by hand. The production of precisely this sort of machine is stated by him in his patent to be "the primary object" of his invention. In so far as Kitselman availed himself of novel features invented and claimed by Davisson, the Davisson patent holds, as to Kitselman, as well as to any other person making either a stationary or portable machine. This qualification due to Kitselman's peculiar place in the art, in my judgment, involves recognition of special force in his claims for combinations productive of his newly adapted machine.

X Q. 33. I notice in figures 18 and 19 of the drawings of the Kitselman patent the illustration of vertical pieces interwoven with the wire meshes. What do you understand to be represented by these pieces?

A. The pieces referred to in the question are vertical wooden slats or pickets, and the figures of the drawings containing them are intended to show that wood picket and wire fencing may be made by this machine in addition to its making the particular kind of fencing (to wit, having multi-tension wires), which it is primarily intended to make. The machine is also adapted to make still other styles of fencing. Thus, the specification says, page 1, line 73: "Figs. 17, 18, 19 and 20 are views of additional styles of fencing (additional to various styles previously referred to) which may be made with my machine. Fig. 21 is an elevation of the style of fencing made when the machine is threaded, as shown in Fig. 2." Later on the specification says (page 6, line 39): "Fig. 18 shows another plan of fencing made by my machine, in which I employ pickets or slats as shown. The threading of the twisters to make this form of meshing shown in this figure and the operation are exactly the same as represented in Figs. 12 and 13 (where all the side twisters are threaded and double overlapping meshes are formed). The palings or pickets are introduced by hand through the meshes of the wires as each mesh is completed.

"Fig. 19 illustrates a common form of wood fence held together by wires. In this instance as many of the twisters are threaded with their side sections as will form the desired number of strands for the fence; but the central sections L have no wire passed through the opening of the front end thereof. It will be seen that the central and side sections of the twisters have slots or openings. The wires for the side sections in this instance are passed through the central shaft or spindle of the central section; then they are separated and one wire is passed through one side section and the other wire through the other side section. In this instance warp or larger wires only are used from the roll or bundle in the rear of the machine, and no woof wires are fed from the spools R on the movable sections of the twisters. In making this style the sliding frame M M remains inactive. The twisters are rotated in first one direction and then the other to twist or weave the wires between the slats or pickets in a straight line, the pickets being introduced by hand, of course."

X Q. 34. Are the inventions described in the various claims of the Kitselman patent which you have considered confined to use in

making a wire-fence fabric pure and simple? Or may they also be used in the making of one in which slats or pickets are interwoven?

A. As those inventions are defined in the claims referred to, they do not necessarily include the special feature which permits the particular mode of stringing the wires involved in making the unmeshed wire and picket fence shown in figure 19. The capability of making the double meshed wire fencing shown in figure 18 I think resides in the machine as described in the Kitselman patent, the production of the double or overlapping meshes resulting from threading all the side sections instead of those of alternate
81 twisters. Whether the pickets shall be inserted or not is a mere matter of choice with the operator. I do not, however, regard the claims as being severally restricted to a construction containing the elements enumerated therein, which, in addition to making a multi-warp wire fence, shall also be able to make this particular fancy pattern. In other words, if a machine shall be so constructed with the elements enumerated in the claims as, for some reason, to be unable to make a double-mesh fence, said machine will not, in my judgment, any less contain the subject-matter of those claims.

X Q. 35. Are the other claims of the other patents that we have been considering confined to use in making a wire-mesh fence pure and simple, or, like the Kitselman claims, may they be used in making a fence of wire mesh and slats or pickets?

A. The mistake must not be made of saying that the machine makes a fence with wood slats or pickets, for it does not. These are put in by hand. It may be said that a machine for making meshed wire fencing with a multiplicity of tension wires (a primary capability of all the patents and machines here in controversy) is capable of making such a form of mesh as will take in the slats (if it is desired to insert them), or that, in addition to making such a wire fence as that first referred to, it will also merely twist warp wires when slats are properly inserted in the course of the operation.

I think any one of the machines here in controversy, including defendants' machine, along with those of the several patents in suit, may be used in making the fence having wooden slats or pickets inserted, as shown in figure 19 of the Kitselman patent, but I do not think this fact affects the claims of either of the patents under which the machine is made. It is an incidental capability, like the capability of a man having legs to jump or kick, as well as to run or walk. The specific object of each of these claimed constructions is to provide a machine which shall be adapted to make meshed wire fencing having a multiplicity of tension wires, and I do not understand that because any one of these constructions permits the introduction of slats in one way or another a claim for such con-
82 struction is restricted to its use in a form permitting the making thereby of some form of slat fence or some form of fancy mesh.

Adjourned to tomorrow morning at 10 o'clock.

CHICAGO, *August* 3, 1898—10 o'clock a. m.

Met pursuant to adjournment.
Present: Parties as before.

X Q. 36. The size of the meshes can be varied in the use of the mechanism called for in the several claims sued on without departing from the essentials of the invention, can they not?

A. Yes. There is this, however, to be noted, namely, that the tension wires must be sufficiently far apart to permit the mesh spools to revolve between them. This is allowable in this particular kind of fencing, and it is only in the manufacture of such fencing that the mesh-wire spools are mounted to revolve about the spindles which hold the tension wires and, therefore, between such tension wires.

X Q. 37. To sum up the results of our study of these patents to this point, I will ask you if it is your opinion that the essentials of the inventions described in the several claims selected for the purpose of this suit, from the patents sued on, are dependent on their use in a stationary or portable machine, or in a power or hand machine, or upon their capacity to weave a fabric in which slats or palings may or may not be used, or upon their capacity to weave a fabric of any special size of mesh?

A. All these questions have been already answered, and referring to the explanations made in the preceding answers to them, I here reply to them as a group by saying that, in my opinion, the essentials of the inventions described in the several claims here in suit are not dependent on their use in a stationary or portable machine, or in a power or hand machine, or upon their capacity to weave a fabric into which slats may or may not be used, or upon their capacity to weave a fabric of any special size of mesh.

X Q. 38. Is there, in your opinion, anything new in the fabric itself considered as an article of manufacture woven by the
83 mechanism described in the several claims enumerated in the patents sued on and now under discussion?

A. So far as my information goes, a meshed wire fabric having tension wires running through all its meshes, or any desired number of them, was first produceable and was first produced by the Davisson machine, by which I mean the machine of the Davisson patent here in suit. This fabric was new with Davisson, as I understand it.

X Q. 39. Referring to the Davisson patent, only two tension wires, and those marginal ones, are shown. Is not this correct?

A. That is correct.

X Q. 40. Are all of the spindles shown in the drawings and referred to in the second and third claims hollow, as you understand it?

A. They are.

X Q. 41. Why were the inner spindles shown in the Davisson patent made hollow, if you know?

A. To allow tension wire to be threaded through them, as the patent states.

X Q. 42. After the outside spindles were shown and described as hollow to provide for tension wires, as shown in the drawings of the Davisson patent, did it require in your opinion, any invention to make the inner spindles also hollow so that they could also be threaded with tension wires?

A. Instead of expressing an opinion as to whether or not this would involve invention, I prefer to state what new capabilities would by such a change be imparted to the machine, and leave it to the court to determine whether invention would be involved or not. Assuming, in accordance with the assumption of the question, that prior to the Davisson invention *of* wire-meshing machine of some kind was known having fixed spindles for two outer or marginal tension wires, but no spindles between them for intermediate tension wires, the introduction by Davisson of such intermediate spindles, one for each twister, would enable the machine to make different widths of the old fabric having marginal tension wires only, and would also enable the machine to make a new fabric having tension wires running through all the meshes between the marginal wires, or through so many of them as might be
84 desired. The conclusion that invention was involved is obvious, I think.

X Q. 43. Are the second and third claims of the Davisson patent limited to a machine in which all of the spindles are hollow, so that intermediate tension wires may be used?

A. Claim 2, by the use of the words "series of spindles arranged in a line," calls at least for three of such spindles, and, according to the specification, by its definition of the word "spindle" and by its statement of the use of such spindle, they will be hollow. At page 1, line 49, the specification says:

"A series of hollow vertical spindles A, A * * *" At page 2, line 73, the specification says:

"The operation of my machine is as follows: The wire from reels P P is carried upward through the outside spindles A A; or, if a narrower fabric is desired, it may be carried through either of the other spindles."

In the contemplation of the patent, therefore, all the spindles A, A, of the entire series are proposed to be hollow. As the illustrations in the drawings show, it is practicable to omit tension wires from either of these spindles altogether and to produce, if desired, a fabric having marginal tension wires only. It is, therefore, possible in the use of an ample series of spindles equipped with spools as described to always omit the tension wire or tension wires from one or more of the inner spindles which it may be determined shall never be used, and if permanently disused these might as well be plugged up or made originally solid. This would compel the making of fencing having no tension wire through a given line of its meshes, but I think the first claim would equally apply to and cover such a construction. Claim 3 specifies "two or more hollow spindles adapted to permit the passage through their axes of wires forming the edges of the fabric," this claim being by its terms applicable to a machine having only two hollow spindles, and these for the marginal wires.

It is to be noted that a condition of each of these two claims in suit is the presence on the spindles of spool carrying and revolving means supporting the revolving spools on opposite sides of
85 the spindles. This condition goes with the claim whatever the number of spindles or whatever the number of hollow spindles in the series.

X Q. 44. Were not the various spindles in the Davisson patent made hollow so that fabrics of diffent widths could be made by using any desired spindle for a marginal tension wire rather than for the purpose of permitting intermediate tension wires to be inserted, particularly in view of the fact that only marginal tension wires are shown in the drawings or mentioned in the specifications?

A. The making of fabrics of different widths by the same machine and without change was one of the two inherent capabilities of the machine as shown and described in the Davisson patent, and it is the only one of the two inherent capabilities to which the patent specification makes reference in terms. As counsel well knows, specifications drawn by patent attorneys do not always express all the possibilities of a machine, however obvious, nor always all the intentions of the inventor. Moreover, as I understand the law, it is not material whether the patent sets forth all the utilities or capabilities of an invention or not. But if I may refer to a fact which I understand will be put in proof, the intentions of the inventor Davisson are more fully shown by the uses to which he put his machine. I understand the machine was actually built and used to make meshed wire fencing having tension wires extending through all the meshes, and that this product, made by the Davisson machine, went into extensive use. I have seen a sample which appeared to me to have stood as a fence many years, and which was represented to me as having stood there for ten or twelve years.

I, of course, cannot say whether Davisson in fact made all the various spindles hollow with the sole purpose in mind of making different widths of fabric having marginal wires only, rather than for the purpose of permitting intermediate tension wires to be inserted. It must have been obvious to him, however, that if a tension wire could pass through either of the spindles at one time, it could do so at another, and that the mesh spools would twist the mesh wire about any tension wire whether accompanied by other-tension wires or not.

X Q. 45. Is it essential, in your opinion, to the combinations described in the various claims in suit from the several patents
86 sued on, that there shall be present in the machine provision for the insertion of intermediate tension wires in the woven fabric?

A. It is.

X Q. 46. Then the claims in suit do not, in your opinion, extend to a machine in which marginal tension wires only are inserted—a machine which, in other words, employs only hollow spindles at the margins of the fabric. Is this correct?

A. That is not correct, and my last answer is, perhaps, not correct. The Davisson patent expressly contemplates in the third claim the

use of only two marginal hollow spindles. What I meant to be understood, but did not properly express, is the contemplation by all of the inventors of the patents in suit of the provision of machinery adopted for making fence-wire fabric having intermediate tension wires. This is an inherent capability of all the machines in question, including that of Davisson as he shows and describes it and as he defines it in claim 2 in suit, but is perhaps not an inherent capability of the Davisson machine as it is defined in claim 3 of the Davisson patent, which employs the term "two or more hollow spindles," and is, therefore, applicable to a machine having only two such hollow spindles, and these, of course, for the marginal wires. While in a practical machine for the uses contemplated by all the inventors of the patents in question the contemplation is to provide for making fabric of various widths any width of which may have intermediate tension wires, I think, on reflection, that the claims of these patents are not restricted so that they would not be applicable to a machine containing the inventions therein defined but having only two of the spindles hollow for marginal tension wires.

X Q. 47. The machine of the Davisson patent sued on is a stationary machine, while the defendants' machine is a portable one. Is not this correct?

A. That is obvious.

X Q. 48. The hollow spindles in the Davisson machine rotate, while the hollow spindles in the defendants' machine are stationary. Is not this correct?

A. It is.

X Q. 49. The hollow spindles in the Davisson machine are advanced to receive the spools carrying the weft wire and re-
87 cede when the spools have been transferred, while in the defendants' machine the hollow spindles have no movement in the direction of their length, but remain stationary. Is not this correct?

A. It is.

X Q. 50. The hollow spindles in the Davisson patent are provided with cross-heads at their outer ends—the ends furtherest from the supporting frame—while the hollow spindles of the defendants' machine are unprovided with cross-heads at their outer ends. Is not this correct?

A. It is correct to say that the cross-heads in the Davisson machine are at the outer or free ends of the spindles and that the cross-heads in defendants' machine are placed further back, or, if you please, at the rear ends of the spindles, having reference to the forwardly protruding portions of the spindles about and opposite which the weft spools revolve.

X Q. 51. I ask you if the hollow spindles in the Davisson machine are not provided with cross-heads at their outer or free ends, and if the outer or free ends of the hollow spindles in the defendants' machine are not provided with cross-heads. Is not this correct?

A. That is correct.

X Q. 52. The cross-heads on the outer ends of the hollow spindles

in the Davisson machine have fixed connection with such spindles so that they and the spools carried thereon are rotated by the rotation of the spindles. Is not this correct?

A. That is true.

X Q. 53. In the defendants' machine are there any cross-heads for carrying the spools which have fixed connection with the spindles?

A. Defendants' machine has cross-heads for carrying the spools which have such connection with the spindles as holds said cross-heads in fixed position in the machine, and which revolve to carry the spools around the axes of the spindles, but which do not receive their rotary motion through the spindles, the latter being, as already elicited and explained, non-rotary or stationary. In other words, in defendants' machine the cross-heads, though mounted upon and supported by the spindles, as in the Davisson patent, rotate upon the spindles instead of being firmly fixed thereto.

88 X Q. 54. I ask you if in the defendants' machine there are any cross-heads for carrying the spools which are mounted upon the spindles and fixed thereto?

A. In defendants' machine there are cross-heads which are mounted upon the spindles, but which are not fixed or rigidly attached to the spindles.

X Q. 55. In the Davisson machine the cross-heads can have no rotary movement without the rotation of the spindles, while in the defendants' machine this is not the case. Is not this correct?

A. In the Davisson machine, if it have the precise construction shown in the Davisson patent, the cross-heads cannot revolve except by rotation of the hollow spindles, and in the defendants' machine this is not the case.

X Q. 56. In the Davisson machine the rotation of the spools carrying the weft wire depends upon the rotation of the hollow spindles, while in defendants' machine this is not the case. Is not this correct?

A. This question has already been answered in speaking of the means through which the cross-heads are revolved, because the spools are carried by and go with the cross-heads. The statement of the question is correct.

X Q. 57. In the Davisson machine all of the spools are transferred from one set of cross-heads to another by one integral device frame or shipping mechanism, while in defendants' machine this is not the case. Is not this correct?

A. The question correctly states the fact as to the illustration of Davisson's machine given in the patent and also the fact as to defendants' machine.

X Q. 58. The shipping mechanism in the Davisson machine is brought into action and does its work while the power is continually applied in the same direction, while in defendants' machine it is necessary to reverse the direction of action of the power to bring the shipping mechanism into operation. Is not this correct?

A. Partially. In defendants' machine the spool-carriers or bob-

bin frames come into proper relation and engagement with the cross-heads adjacent to those by which they are being revolved in the course of every revolution of the cross-heads, so that by a reversal of the direction of the motion of the crank said bobbin
89 frames may be made to leave the cross-heads which have been carrying them and to be taken up by the cross-heads which have been idle. But, on the other hand, if the reversal of the crank be not made, said bobbin frames will continue to be carried by the cross-heads which have brought them to this point. This is owing to the peculiar features of construction in the devices of defendants' machine by which the bobbin frames are engaged with and disengaged from the cross-heads.

As to the Davisson machine, as shown in the patent, the shifting of the spool-carriers from one cross-head to another is also accompanied by a reversal of the rotary motion of the cross-head, although this occurs in connection with a continuous rotation of the main driving pulley. I mention this, however, rather as an incident than as a material fact, because, without material change, the Davisson cross-head could be given a rotation in one direction only and the transfer of the spool-carriers equally well effected.

X Q. 59. In the Davisson machine the spools are transferred from one cross-head to another while the power operating the machine is constantly applied in the same direction, while in the defendants' machine it is necessary to reverse the power in order to secure the transfer of the spools. Is not this correct?

A. The belt pulley through which power is supplied to the Davisson machine always turns in the same direction, though the cross-heads on the spindles reverse their direction of rotation at the time the spool-carriers are shifted from one cross-head to another. In defendants' machine the peculiar construction of the devices for engaging and disengaging the spool-carriers with the cross-heads makes it necessary, and it is necessary, to reverse their direction of motion, and without intervening mechanism between the hand crank and the cross-heads, it is also necessary in defendants' machine to reverse the direction of the crank, in order to transfer the spool-carriers.

X Q. 60. In the Davisson machine the cross-heads are square bars or pieces extending out from the hollow spindles, while in
90 defendants' machine the parts which you have denominated cross-heads are not square bars or pieces. Is not this correct?

A. It is. In one case, to wit, the Davisson, the square portion of cross-head enters the spool-carriers and in the defendants' machine a portion of the spool-carrier enters the cross-head. The cross-heads differ in form in the two machines with reference to these two different mechanical modes of connecting with the spool-carriers.

X Q. 61. In the Davisson machine the spool is transferred from one cross-head to another by bringing the cross-heads into line with each other so that the spool can be shifted by moving it to one side and without changing its horizontal plane, while in the defendants' machine the so-called cross-heads are never brought into the same

horizontal planes, nor the spools shifted by moving them in their horizontal planes. Is not this correct?

A. The cross-heads of defendants' machine are never in a horizontal plane, because they are in an upright machine, and the cross-heads of the Davisson machine are always in a horizontal position because they are in a horizontal machine. So far as the question depends upon this state of facts, its statement is true. It is, however, true in defendants' machine, as in the Davisson machine, that the cross-heads are in the same plane when the spool-carriers are shifted from one to another. In the defendants' machine, by reason of the Kitselman improvement, the cross-heads are never out of the same plane, while in the Davisson machine alternate cross-heads and their accompanying spindles are shifted so that the cross-heads are in the same plane only when it is desired to shift the spool-carriers. In the Davisson machine, moreover, the spools have their axes in a plane at right angles to the spindles, and it is in this position that the spools, with their coincident carriers, are transferred. In defendants' machine the spools also have axes in the plane at right angles to the spools, and it is in this position that they are shifted with their carriers from one cross-head to another. The two machines differ with respect to the exact position of the spools at the moment of transfer in this, that while the axis of the spool in the Davisson machine is directed towards the spindle, the axis of the spool in the defendants' machine is tangent to a circle drawn from
91 the axis of the spindle. This is a mere matter of choice in the construction. The cross-heads in defendants' machine are brought into line with each other preparatory to their transfer as much as they are in the Davisson. By which I mean that the recesses of adjacent cross-heads in defendants' machine are brought into opposition to each other as the ends of the cross-heads or the recesses of the spool-carriers are brought into opposition to each other in the Davisson machine.

X Q. 62. In the Davisson machine the spools are transferred from one cross-head to another by shifting the positions of the cross-heads until they come into line end to end, so that the spool-carrier and spool are moved sidewise in the direction of their axes, while in the defendants' machine the so-called cross-heads constantly remain in the same plane and the spool-carriers and spools, when shifted, are not shifted by moving the carriers in the direction of their axes. Is not this correct?

A. This is true, the spools and their carriers in the Davisson having coincident axes (the spool being mounted in a cylindric case in the center of which is the hole for the cross-head), and the spool-carrier of defendants' machine having the spool mounted with its axis transverse to what may be called the longitudinal axis of said carrier.

X Q. 63. If we were to take the cross-heads of the Davisson machine and remove the so-called cross-heads of defendants' machine and transfer them from one machine to the other, respectively, would we have operative combinations after making such a transfer of the cross-heads from one machine to the other?

A. Cross-heads of disk form and recessed to receive spool-carriers, together with spool-carriers having the spools mounted therein as they are in the defendants' spool-carriers, could be used in the Davisson machine and the bar form of cross-heads with spool-carriers like those of the Davisson machine could be employed in defendants' machine. Of course, these changes would involve others, and it is true that without change the identical spool-carriers of either of these machines cannot be interchanged with those of the other.

X Q. 64. My question was intended to ask whether the Davisson form of cross-head could be used in the defendants' machine
92 with the defendants' spool-carriers and spools, and the defendants' form of cross-heads in the Davisson machine with the Davisson spool-carriers and spools. In short, I desire to know whether the cross-heads could be transferred from one machine to the other and used with the other mechanism contained in such machines, respectively, and whether, after such transfer, we would have operative combinations.

A. The transfers referred to cannot be made without suitable changes for adapting the parts to each other and, of course, no operative machine can be made of either by attempting such transfer without such changes. With suitable changes, the transfers referred to can be made, and operative machines result.

X Q. 65. If we took the defendants' machine as a starting point and reorganized it so that the spindles would rotate, so that some of them would be advanced to operative positions while others were retracted, so that each spindle was provided with the bar form of cross-head, so that the spool-carriers and spools had coincident axes and moved in the direction of their axes while being transferred from one spindle to another, so that the power applied to the machine continually operated in the same direction, and so that we would no longer have the rounded form of cross-heads, so called, nor stationary spindles, nor spool-carriers and spools with their axes at right angles to each other, nor spool-carriers which were transferred by moving them in a reverse direction, nor power which had to be reversed before a transfer of spool-carriers and spools could be effected, to say nothing of other changes that would be necessary, there would practically be no part in the machine which it had not been necessary to change in some way in converting defendants' form of machine into the Davisson form of machine, would there?

A. There would be a great change in originating the Davisson machine from the defendants' machine as a starting point, as there was a great change in originating the Kitselman machine from the Davisson machine as a starting point. If, however, counsel means to be understood or to indicate that all the changes enumerated by him to be necessary for the transfer of the cross-heads and spools, referred to in the last preceding few questions and answers, he is in error.

X Q. 66. The "bearings" mentioned in the second claim
93 of the Davisson patent are journals in which the spindles rotate, are they not?

A. They are the parts which, by contact or "bearing," support

the spindles. In this particular case the spindles rotate upon some of the bearing surfaces and, at times, they slide; at other times they are at rest in contact with other bearing and supporting surfaces. The term equally applies to the parts or surfaces supporting a thing whether the latter is rotary or otherwise movable or stationary.

X Q. 67. In the Davisson machine organized as shown and described in his patent sued on, it is necessary for the bearings to be sliding bearings, is it not?

A. Provision must be made in the supporting bearings for the longitudinally reciprocating spindles shown in the Davisson patent for such a movement as well as for their rotation. The lowermost bearings proper are solely rotary, such rotary movement being performed in castings, B, that have a sliding movement within guides on the frame. The upper bearings are non-rotary and purely sliding, being the square holes in the pinions *a* for the upper squared portions of the spindles A.

X Q. 68. In your answer you have spoken of two kinds of bearings, as I understand you, the rotating and the sliding. Which kind of bearings is that referred to in the second claim of the Davisson patent?

A. The term bearings in the second claim of the patent embraces both, and any other suitable bearing on a supporting frame.

X Q. 69. In the defendants' machine the bearings for the spindles are neither rotating nor sliding, are they?

A. The spindles neither rotate nor slide in their bearings in the defendants' machine, but are fixed therein.

X Q. 70. In the defendants' machine the spindles are simply rigidly fastened to the frame through holes made through it at suitable intervals. Is not this correct?

A. They simply rest or bear in the holes of the frame and by a shoulder against the front surfaces of the frame, and are held against longitudinal forward displacement by nuts on their rear ends, which nuts bear against the rear surface of the frame. They are, therefore, amply "mounted in bearings on a suitable supporting frame."

94 X Q. 71. Turning now to the Kitselman patent sued on, I find that in the first, second, ninth and twentieth claims the words "sectional twisters" are used, while in the tenth claim the word "twisters" is used, and in the fifteenth claim the word- "rotary twisters" are used. What difference, if any, are we to understand from this difference in the use of terms that I have called attention to?

A. If counsel will read a little further in claims ten and fifteen he will find the words "each (twister) comprising a central section and "the side section (sections?), each side section carrying a spool or "reel for wire," as claim ten has it, or the words "each twister hav- "ing a central section capable of rotary movement only, and to side "sections which are capable of a shifting movement independently "of the central section in opposite directions simultaneously," as claim fifteen expresses it. The twisters of claims ten and fifteen are, therefore, sectional. The twister element in all these claims is a

sectional twister and the claims will differ in scope or applicability as their terms may refer to different features, movements, etc., belonging to a three-part sectional twister.

X Q. 72. Then, I may consider that the terms, "sectional twisters," "twisters" and "rotary twisters," used in the several claims under consideration refer to the same combination of parts or devices and that they are called sectional twisters because they are composed of different parts or sections. Is this correct?

A. I think you may consider that the terms "sectional twisters," "twisters" and "rotary twisters," used in the several claims under consideration, refer to the same three-part twister devices, embracing, but not, in my judgment, restricted to, the forms of such devices shown and described in the patent; and that said twisters are called sectional because they are composed of separable parts or sections of which the side sections carrying the weft spools are movable to co-act with different central sections or spindle portions.

X Q. 73. These sectional twisters are shown in detail in figure 7 of the drawings with the spools detached or absent, are they not?

A. One form of sectional twister is shown in figure 7 of
95 the drawings with the spools belonging to the side sections and with the pinion belonging to the central section absent.

X Q. 74. Do you find in the Kitselman patent any illustration or description of any other kind of twister except the sectional twister shown in figure 7?

A. I do not.

X Q. 75. The central section marked "L" of what I shall term, for convenience in my questions, "Kitselman twister," is constantly rotated in the twisting operation of the machine, and always in the same direction. Is not this correct?

A. It is.

X Q. 76. The side sections J and K of the Kitselman twister are arranged alongside of and parallel with and are rotated by the rotation of the central sections, are they not?

A. They are.

X Q. 77. The arrangement of the parts in a Kitselman twister is such that the side sections would not be rotated unless the central section be rotated. Is not this correct?

A. That is true.

X Q. 78. In order to distinctly understand what we are talking about, I will ask you to particularly point out and designate the part in the defendants' machine which, in your opinion, corresponds to the central section of the Kitselman twister.

A. The Kitselman twister has a central section composed of a shaft which forms the spindle and a pinion mounted on said shaft. In the specific form in which it is shown in the Kitselman patent and in the Kitselman machine No. 1, the shaft or spindle rotates with the pinion because the pinion is made fast thereto. This rotation of the pinion performs the sole useful purpose of carrying the spools around the spindle in order that the spool wires may be twisted about the tension wire passing through and guided and supported by the spindle. Kitselman, who rotated his spindle

along with the pinion, applied to his spindle the arms for engaging and carrying around the spool-carriers with their spools. Defendants' machine has twisters of which the central section is composed of identically the same parts, namely, a hollow shaft or spindle and a rotating pinion. The object of the pinion in its rotation is solely that of carrying the spools around the spindle in order to
96 twist the spool wires about the tension wire passing through the spindle. Defendant does not rotate the spindle, having, according to the Pope invention, made the central section with loosely connected parts and with the spindle part fastened non-rota-bly to the frame and the pinion alone rotatable, being for this purpose axially mounted upon the stationary spindle. As defendant does not rotate the spindle itself of the central section, but only the pinion of said central section, he, further following the Pope invention, detachably engages the spool-carriers with the pinion instead of with the spindle. The central section of defendants' machine is, therefore, still the central section of the Kitselman invention, in my opinion, or, if you please, is the rotary central section of the Kitselman invention, because so much of said section still rotates in the defendants' machine as is necessary to the purpose of carrying the mesh-wire spools about the spindles. That is to say, I do not regard the transfer of the engagement of the spool frame from the spindle of the central section to the pinion of the central section as relieving defendants' machine from dependence upon the Kitselman claims in suit, or, in other words, as making the central section of defendants' sectional twister other than the central section of the sectional twister of the Kitselman patent, as defined in the claims in suit.

Adjourned to tomorrow morning at 10 o'clock.

CHICAGO, *August* 4, 1898—10 o'clock a. m.

Met pursuant to adjournment.
Present: Parties as before.

X Q. 79. So far as the central section is concerned, the protruding portion of the stationary spindle in the defendants' machine could, in your opinion, be omitted and still the defendants' twister would employ, in your opinion, the central section of the Kitselman twister. Is this correct?

A. That is not at all correct, and does not at all follow from anything that I have said. It is one of the features of Kitselman's invention that the free extremity of the spindle is made prac-
97 tically flush with the outer and the inner ends of the spool-carriers, the utility of this feature of improvement over the Davisson being pointed out in detail in my direct testimony. You may say that Kitselman moved the cross-heads back on the spindles from their extremities or that he extended the spindles forward beyond the cross-heads, to give this substantial flushness. Whichever way you look at it, a protruding portion of the spindle beyond the cross-head and between the spool-carriers is a characteristic feature of the Kitselman twister. The cutting off of the spindle down to

the retracted cross-head would restore the original construction of the Davisson in this particular with its faults and would rob the Kitselman of his improvement in this particular, with its advantages.

X Q. 80. If in the defendants' machine the protruding portion of the stationary spindle were cut off close to the cross-heads, as you term them, then such machine would not employ the Kitselman twister called for in the claims of the Kitselman patent sued on, would it?

A. Probably none of the Kitselman claims in suit would then apply to the defendants' machine. There is a doubt in my mind only as to certain of said claims which make their point especially upon the direct gearing together of the adjacent twisters, as, for example, the ninth, and even as to these claims I am disposed to regard the claims as restricted by their terms to the characteristic improvement made by Kitselman over the Davisson with respect to the flushness of the spindles and spool-carriers, arranged alongside the protruding portions of the spindles.

X Q. 81. The side sections of the Kitselman twister are said, in the first claim, to receive rotary motion from the central section to form the twist. Is that true of the side sections in all of the claims of the Kitselman patent under consideration? That is, do they all rotate and do they all get their rotation from the central sections, as is expressed to be the case in the first claim?

A. After looking over the claims in suit with reference to this particular point, I am disposed to regard not only claim 1, but claim 2, claim 9, claim 15 and claim 20, as probably intended to involve the condition referred to in the question. Claims 10
98 and 11, while they, of course, apply to a construction involving that condition, may possibly be regarded as not being restricted thereto. I do not desire to express a final opinion on this point as to claims 10 and 11 at this time.

X Q. 82. Does the Kitselman patent describe any kind of side sections for the twisters which are not rotatable and which do not receive their rotation from the central sections of the twisters?

A. It does not.

X Q. 83. The first claim of the Kitselman patent speaks of the side sections as being shifting sections. Do not the side sections of all of the claims of the Kitselman patent under consideration have the capacity of being shifted, so that, in addition to being rotatable sections, they may also be said to be shifting sections?

A. They do.

X Q. 84. The shifting of the side sections of the Kitselman twister is effected by sliding them up or down from one spindle to the next adjacent. Is not this correct?

A. In the Kitselman machine as shown in the Kitselman patent this is the movement and this is the direction of movement of the side sections.

X Q. 85. Does the Kitselman patent describe or show any other means or method for effecting the shifting of the side sections of the twisters?

A. It does not.

X Q. 86. In the Kitselman patent all of the side sections at one side of the spindles are attached together, or, rather, to a common bar, and all of the side sections on the opposite sides of the spindles are similarly attached, so that by operating a hand lever at the desired time the two sets are shifted simultaneously. Is this correct?

A. All the side sections at either side (when the three sections are in a horizontal plane) are fully engaged in recesses in the vertical sliding bars arranged at each side of the machine, so that by lifting or lowering either of said bars the side twister sections engaged thereby will be raised or lowered as the bars are connected, so that one rises as the other descends, and all the side sections in the machine are shifted simultaneously.

X Q. 87. Does the Kitselman patent sued on show any
99 other means or method of effecting the shifting of the side sections of the twisters?

A. It does not.

X Q. 88. I notice that the second claim of the Kitselman patent speaks of a shifting longitudinal movement of the side sections. Is this the shifting operation that we have considered in the last few questions?

A. I think these words mean lengthwise of the machine as a whole and refer to the shifting of the side sections to a twister above or below that from which it is shifted, this being the longitudinal direction of the machine as a whole.

X Q. 89. This second claim also speaks of the central portion or section being movable only on its axis. Does this mean rotatable?

A. Undoubtedly; that is, movable only in a rotary direction.

X Q. 90. The ninth claim says that the central section of each twister is geared to the twister adjacent thereto. Is this gearing of the central sections together the means shown and described in the patent for imparting rotation to them?

A. It is. Each gear or pinion, being a part of the central section, is rotated by engagement with a similar adjacent pinion, and all are rotated simultaneously by the application of driving power or a crank to one of them.

X Q. 91. In the machine described in the claims of the Kitselman patent sued on the central spindle rotates, while in the defendants' machine the central spindle is stationary. Is not this correct?

A. As already stated in my former answer to precisely the same question, the spindles shown in the Kitselman patent and, of course, embraced in the claims in suit, rotate along with the pinion portion of the same central section, and in defendants' machine the spindle portions of the central section do not rotate, and only the gear and cross-head portions of said sections do rotate.

X Q. 92. In the machine of the Kitselman claims under consideration the pinions are fast with the central spindles, while in defendants' machine they are loose on the central spindles. Is not this correct?

A. Let me ask if, by the peculiar wording of counsel's
100 question, he desires to elicit the facts as to what is shown in the Kitselman patent drawings and described in the specifi-

cation as the selected embodiment of Kitselman's invention, such illustrated and described form of construction forming the basis of the claims, or whether he desires that his question shall be understood to involve a limitation of the claims to the particular construction referred to?

X Q. 93. I desire to see what differences between the Kitselman machine, as illustrated and described in his patent in suit, and the defendants' machine which we can agree upon, so as to eliminate as far as possible question or controversy as to the differences to which attention is called.

I ask you if the gears or pinions in the Kitselman machine are not fast with the central spindles, while in the defendants' machine they are loosely mounted on such spindles. Is not this correct?

A. Now, understanding that by the Kitselman machine is meant the Kitselman machine as illustrated in the drawings of the Kitselman patent in suit and as embodied in the "Complainants' Exhibit Kitselman Machine No. 1" (which corresponds with the patent), I reply that in such illustration and embodiment of the Kitselman machine the gears or pinions are fast with the central spindles and that in defendants' machine the gears or pinions "are loosely mounted on such spindles."

X Q. 94. The side sections referred to in the several claims of the Kitselman patent sued on are what we have repeatedly in previous portions of your deposition designated as the spool-carrier frames and spools mounted thereon, are they not?

A. Yes.

X Q. 95. In the Kitselman machine the side sections or spool-carrying frames and spools on the respective sides of the central spindles are mounted on a common bar, and are shifted by a hand lever, while in defendants' machine the spool-carrying frames and spools on the opposite sides of the central spindles are separate and independent and not mounted on a common member, and are not shifted by a hand lever. Is not this correct?

A. In defendants' machine the shifting sections of the various twisters are not shifted by a hand lever, but automatically and independently by shifting mechanism, broadly in accordance
101 with the improvement made by Conner upon the Kitselman machine. It was a result of Conner's improvement and, therefore, a fact in the defendants' machine, which contains a form of the Conner invention, that the longitudinal shifting bars employed by Kitselman are dispensed with.

X Q. 96. In the Kitselman machine, the side sections on the opposite sides of the central frames are moved or shifted by a sliding movement directly up and down, while in the defendants' machine the spool-carrying frames and spools are shifted by a rotary movement. Is not this correct?

A. In defendants' machine the side sections are shifted to an upper or lower twister in a rotary movement of the twisters, while in the Kitselman machine they are shifted up and down in the absence of rotary movement.

X Q. 97. In the Kitselman machine the side sections require and

are provided with means for supporting them at each end, and if either end were unsupported by such means, the side sections would drop out, while in defendants' machine the side sections require and are only provided with means for supporting them at one end. Is not this correct?

A. It is, this being in accordance with the Pope improvement upon the Kitselman machine.

X Q. 98. In the Kitselman machine the side sections could be lifted out and turned end for end and inserted on the opposite side of the central spindle, while in defendants' machine the spool carrying frames and spools, or side sections, as you term them, could not be taken out and reinserted end for end, is not this correct?

A. The side sections of defendants' machine could be changed end for end by some modification, and the side sections in the Kitselman machine cannot be changed end for end without some modification.

X Q. 99. In the Kitselman machine the side sections could be lifted out and reinserted end for end so as to operate by providing another hole for the weft wire to pass out, while in the defendants' machine the side sections could not be lifted out and reinserted end for end without practically reconstructing them. Is not this correct?

A. The side sections of defendants' machine can be lifted out with greater ease than the side sections can be removed in
102 the Kitselman machine. In the Kitselman machine No. 1, the semicircular end portions of the spool frame, being substantially alike except that one is perforated to deliver the spool wire while the other is not, this spool frame could be changed end for end and, with a hole made in the now imperforate end, it would deliver the wire in that position. The spool on this frame of the Kitselman machine is placed as remote as practicable from the front-end plate of the frame and farther from the front end than from the rear end; in reversing the position of the spool-carrier the spool should also be moved along.

In defendants' machine the spool frame is an open loop provided at one end with a notched disk and at the other end with a T head for engagement in a recess of the cross-head on the gear. To make this spool frame reversible end for end would require the transposition of these end parts and, incidentally, a slight modification in one end of the spool frame.

It may be briefly stated as a fact that both machines have their parts adapted for the particular forms of construction present in said machines respectively, and they are not made with a view of interchanging side sections or any other parts, end for end, or otherwise, and, therefore, neither machine has been contrived with reference to the ease with which an end-for-end change could be made. It may be further stated that if there were any reason in the world for desiring to change the side sections of the twisters end for end, they would doubtless be modified mechanically to facilitate such a change. Thus, for example, I can see that by originally screwing the spool of defendants' machine into the rear T head and similarly screwing

the disk on a prolonged central screw-threaded stud like that at the rear, the wholly useless reversal, end for end, of the spool-supporting frame could be effected by merely separating the parts and reversing the loop and spool between the end pieces.

The same amount of difficulty would accompany the end-for-end reversal of the side sections in the Kitselman machine if the segmental end pieces were not, as they happen to be, of the same size. They are not made of the same size for the purpose of reversing them, but plainly for mechanical convenience and other advantages in construction.

103 X Q. 100. In the Kitselman machine, as illustrated and described in the patent and as embodied in the full-size machine before us, it is necessary that the central spindles or sections shall rotate in order to have an operative machine, while in defendants' machine it is not necessary that the central spindles should rotate. Is not this correct?

A. In the exact construction shown in the Kitselman patent and embodied in this Kitselman machine No. 1, it is necessary that the spindles shall rotate, and in defendants' machine it is not necessary that the spindles should rotate, although they might be made rotatable, if desired. In defendants' machine it is merely a question of making the spindles fast in their bearings in the frames and their pinions loose, instead of making the spindles loose in the frame bearings and fast to the pinions.

X Q. 101. In the Kitselman machine, as illustrated and described in his patent and as embodied in the full-size machine before us,—Kitselman machine No. 1,—we would destroy the operativeness of the machine if we were to make the hollow central spindles stationary instead of rotative, while in the defendants' machine we would not destroy its operativeness by making the hollow central spindles rotative instead of stationary. Is not this correct?

A. By reason of the fact that in the Kitselman machine, wherein the spindle does rotate, the engagement for carrying around the spool frames or side sections is made with the spindles and not with the gears: it is true that in this Kitselman machine, if these spindles were to be secured against rotation, the machine would not be operative. In defendants' machine, on the other hand, the spindles could be made to rotate with their gears operatively, if only suitable bearings were provided between the spindles and the frames where now these have rigid connections.

X Q. 102. If we transferred the side sections or spool-carrying frames and spools from the defendants' machine into the Kitselman machine, or transferred the side sections or spool-carrying frames and spools from the Kitselman machine into the defendants' machine, would we not have an inoperative machine?

104 A. The parts would not fit, and the machine would not operate.

X Q. 103. If we transferred the central sections, so called, of the defendants' machine into the Kitselman machine, or the central sections of the Kitselman machine into the defendants' machine, would we not have an inoperative machine?

A. This is practically the same question as the last, and I reply that the parts would not fit, not being made interchangeable, and the machines would not work.

X Q. 104. If the shifting devices were transferred from the Kitselman machine to the defendants' machine, or the shifting devices of the defendants' machine transferred to the Kitselman machine, would we have an operative machine?

A. The parts referred to are not interchangeable, and we would not have an operative machine.

X Q. 105. Please state whether, in your opinion, the Kitselman machine, as described and claimed in the patent sued on and as embodied in the Kitselman machine No. 1 before us, contains the combination and invention specified and called for in the second and third claims of the Davisson patent sued on?

A. It does, in my opinion.

X Q. 106. Turning now, to the Conner patent, the second and third claims call for a train of intermeshing gears arranged in line, in the one claim, and of equal diameter, in the other. Is the same train of gears referred to in each claim?

A. The same train of gears is referred to in both claims.

X Q. 107. The second claim says that each gear has a hollow shaft, and the third claim says that the gears are mounted on prolonged hollow shafts arranged in a line. Are the same hollow shafts referred to in each of these claims?

A. I think so.

X Q. 108. The second claim speaks of notched spool-carrier discs, mounted on the hollow shafts, and the third claim speaks of spool-carriers mounted on said hollow shafts and having notched discs. Please explain the difference between these elements in the two claims, and designate the different parts by the numeral used in the drawings or specification to identify it.

A. I think the expressions quoted from the two claims in
105 suit have reference to the same thing, namely, the contrivance of notched discs operating to carry and to support the bobbin frame or spool-carrier proper, relative to the spindle. The actual construction shown in the patent consists in the formation of the notched discs directly upon and integral with the spindle. The spindle in this construction having rotation, the discs correspondingly rotate and carry the spools around in their curved course at the same time that they support the spool frame at the proper distance from the spindle.

X Q. 109. The notched spool-carrier discs appear to be numbered "7" in figure 5 and to be mounted on the hollow shaft numbered "3." This is correct, is it not?

A. It is.

X Q. 110. The claims next speak of bobbin frames. These bobbin frames are shown in figure 6 detached, and in figures 2 and 3 in place in the machine, and they are numbered as 10. Is not this correct?

A. That is correct.

X Q. 111. The second claim next speaks of automatic switches,

and the third claim speaks of switches. Are the same switches referred to in these claims and do they in each perform the same work or function?

A. Both claims apply to automatic switches, but claim 3 probably does not demand that the switches shall be automatic.

X Q. 112. In the operation of the Conner machine, by which I mean now and whenever I may use the term, the machine illustrated and described in the Conner patent sued on, the driving mechanism was constantly applied in one direction so that the driving pulley or wheel constantly rotated in the same direction. Is not this correct?

A. It is.

X Q. 113. As I understand the patent, the Conner machine is a stationary machine adapted for factory work, as distinguished from a portable machine, adapted for field-work. Is not this correct?

A. It is.

X Q. 114. In the Conner machine the hollow spindles rotate, while in the defendants' machine they are stationary. Is not this correct?

106 A. It is.

X Q. 115. In the Conner machine the traveling spool-carriers, as they are termed in the specification, or the bobbin frames, as they are termed in the claims, are supported and are required to be supported at both ends, while in the defendants' machine the spool-carrying frames are only supported and required to be supported at one end. Is not this correct?

A. Not exactly, as to defendants' machine. The spool-carriers or bobbin frames of defendants' machine are sufficiently attached to the cross-heads (which cross-heads contain the notched discs, at the rear ends of the spindles in this machine) to be held up at their outer ends, but said defendants' machine employs notched discs at the outer ends of the spool-carriers for their proper support and to keep them against drawing inward improperly toward the spindles, and generally to steady them, in the twisting operation. These notched discs form the outer end pieces of the spool-carrier frames, and they bear at their notches against the sides of the spindles near the outer ends of the latter.

X Q. 116. In the Conner machine, the traveling spool-carriers or bobbin frames can only be transferred from one spindle to another by rotating the parts in one direction, while in the defendants' machine they can only be transferred from one spindle to another by reversing the direction of rotation. Is not this correct?

A. In the particular arrangement and construction of the switch devices shown in the Conner patent, wherein they are contrived suitably to go with twisters which rotate continually in the same direction, it is necessary that such rotation in this direction (or, rather, in these directions, for alternate twisters rotate in opposite directions), shall be pursued to effect the switching. In defendants, machine, on the other hand, the switching devices are contrived to require a reversal in the direction of rotation of the switches to effect the switching.

X Q. 117. In the Conner machine the traveling spool-carriers or

bobbin frames in the act of changing or being transferred from one spindle to another first pass to the opposite side of the spindle,
107 while in the defendants' machine the spool-carrying frames are required to transfer or pass from one spindle to another on the same side. Is not this correct?

A. Yes, this being an incident of the reversal of motion referred to in the last question and answer. Believing this question and answer may not be readily apprehended by the reader, I explain by saying that the Conner patent illustrates the path of travel of any twister, in being shifted from one twister to another and back again, by means of the numeral "8." Holding the figure 8 before the eye and placing a pencil point at the middle of the figure, the direction of motion of the spool-carrier will be, say, upward to the right, over the top, downward at the left through the middle point of starting, then downward to the right, and finally upward at the left back to the point of starting. In defendants' machine the spool-carrier describes the same figure 8, but instead of proceeding upward from the central point of the figure at the right side, it proceeds upwardly at the left over and down to the point of starting, then downwardly at the right across the bottom and upwardly to the point of starting.

X Q. 118. In the Conner machine is it possible to transfer a spool-carrier or bobbin frame, and cause it to travel on the same side of the spindle immediately and without first passing to the opposite side of the spindle, and in the defendants' machine is it possible to transfer a spool-carrier and cause it immediately to pass to the opposite side of the spindle without first traveling on the same side?

A. It is not, without some changes in the switching devices, these being contrived so as to give and require the difference in making the figure 8 by the spool-carrier that I have pointed out in my last answer.

X Q. 119. In the Conner machine there are pivoted switches which at stated intervals, turn on their pivots into new positions and thus change the path of travel of the spool-carriers or bobbin frames, while in the defendants' machine there are no pivoted switches which at stated intervals and by the constant rotation in the same direction of the machine will change their positions or turn on their pivots to transfer the spool-carriers. Is not this correct?

A. In the automatic arrangement and connection of the switches shown in the Conner patent they operate at stated intervals,
108 but disconnecting them from the driving gear and leaving them to be operated by hand, they would not necessarily be operated at stated intervals. The switches are also shown in the Conner patent as being mounted upon pivots, or pivoted levers, so as to carry them successively from one position to another, but they need not be pivoted, as, for example, they can be made to project directly from a sliding bar, such, for instance, as now operates them in their pivoted relation. However, as they are shown in the Conner patent, they are pivoted and operate automatically at stated intervals, and they also operate in connection with a motion of the

parts in one direction. In defendants' machine, the switching devices, or means for shifting the spool-carriers from one set of notched discs to another, are quite different and peculiar in detail of construction. As in the Conner patent, so in the defendants' machine, when the spool-carriers are brought into line with each other and with the spindles, said spool-carriers are as much engaged with one notched disc as with the opposite one, for it rests, as between jaws, in the two opposing notches of the adjacent discs. In defendants' machines, moreover, the spring catches in the notched discs or cross-heads which engage the shoulders on the T head of the spool-carrier frame, are both in engagement with said shoulders. One of these catches will seize upon and hold the T head or spool-carrier to the notched disc to which said catch belongs if rotation is given to said disc in one direction and will release it or move away from the shoulder if opposite rotation be given to said disc. In other words, neither spring catch (which may be called the switch device), will deflect the course of the spool-carrier, and which one of the two will be brought into action for this purpose depends upon which direction of motion is given to the twister in moving it from this point where the spool-carrier is engaged by both discs. The switch pins or catches in defendants' machine are not literally pivoted, but they are nevertheless moved, their movement into engaging position being effected by the springs connected with them. They do not act necessarily at stated intervals, but they are at stated intervals brought into position where they may act, to wit, by the reversal of the crank. They do not act by continued ro-
109 tation of the twisters in the same direction, the twisters being reversed, as stated, to effect the shifting.

X Q. 120. Do you answer my question 119 generally in the affirmative or in the negative?

A. A categorical answer to the many conditioned question No. 119 would be in the affirmative, and this is the general purport of the explanatory answer thereto that I have thought it desirable to give.

X Q. 121. Please point out the particular parts in the defendants' machine which you denominate the switches and which you consider to be the equivalent of the automatic switches of the Conner machine.

A. Taking the switch 19 of the Conner machine as an illustration, it will be seen that said switch is a part which, in the travel of the spool-carriers, changes the course of the latter and causes it to leave the notched disc of one twister and to proceed with the notched disc of the adjacent twister. The switch seizes, so to speak, or encounters a part on the spool-carrier to produce this effect. In defendants' machine the spring pins (which are mounted in the notched discs and project into the space between said discs and the adjacent gears, that is, in the recess into which the T head of the spool-carrier projects), are what I call the switches in that machine. At every revolution this spring pin is thrust into position to seize or encounter a shoulder on the spool-carrier, so that it will take the spool-carrier out of the notch of one twister disc and cause it to pro-

ceed in the notch of the disc of the adjacent twister, proper direction of motion being given to the twisters for this purpose.

X Q. 122. In the Conner machine the switches are mounted on bars running along the top and the bottom of the frame, or parallel with the line of the twisters, while in defendants' machine the parts which you denominate the switches are not mounted on bars running lengthwise of the twisters, but are mounted in the parts which you have treated as the inner notched discs of the claims sued on. Is not this correct?

A. Not strictly. In the Conner machine the switches are pivoted on the frame adjacent to the notched discs and twisters and are only operated by connection with the bars referred to. The
110 switches in defendants' machine are mounted as stated in the question.

X Q. 123. In the Conner machine the traveling spool-carriers or bobbin frames never come into position between two spindles where they can be transferred at will from one to the other, while in the defendants' machine they do come into such position so that they can be transferred at will. Is not this correct?

A. Not exactly. In the Conner machine the spool-carriers come into position where they can be transferred from one twister to another twice in the course of every revolution of the twister precisely as they do in defendants' machine. Whether they will, in fact, be transferred from one to the other, when they will be, and upon which direction of motion they will be thus transferred, depends altogether upon the presence of the switches, in the first place, and in the second place, upon when and which direction of motion the action of said switches shall require. As the switches are shown in connection with the Conner machine, they act after every second revolution, I believe, and they act in a forward movement of the twisters. In defendants' machine switches are pre-ent and they act whenever the operator desires after any full revolution, and they act on a change of direction of revolution.

X Q. 124. In the Conner machine it is not practical, or, I may say, possible, to have a spool-carrier in such relation to two adjacent spindles that it may be operably rotated around either; while in defendants' machine this is perfectly practicable and possible. Am I not correct?

A. No. In the Conner machine the spool-carrier does operate about either twister, and the same is true in defendants' machine. Every spool-carrier operates successively about two adjacent twisters, being carried from one to the other by the switch. If counsel means to ask whether, in the Conner machine, as in the defendants' machine, the operator may choose his time for operating the switch, I answer that, with the connections of the switches with the driving mechanism shown in the Conner (whereby they are given automatic movement and action at definite intervals), he cannot, whereas
111 defendants' machine is a hand machine the crank of which the operator may reverse at any time at his pleasure.

X Q. 125. In the Conner machine, and in accordance with its scheme of construction and operation, a spool-carrier never comes

into such relation with two adjacent spindles that it may be operably rotated around either at the will of the operator, while in the defendants' machine the spool-carriers do come into such relations. Is not this correct?

A. Understanding this question to refer exclusively to the condition imposed by the switch in the precise construction shown in the Conner patent whereby they are made to operate at stated intervals independently of the will of the operator, while the defendants' machine being a hand machine, is altogether subject to the operator's will, this is correct.

X Q. 126. In the Conner machine the traveling spool-carriers or bobbin frames are transferred from the notches of one pair of discs into the notches of an oppositely rotating pair of discs, and this is always the case, while in defendants' machine the spool-carrying frames are always transferred into discs rotating in the same direction. Is not this correct?

A. From one standpoint it is, and from another it is not. In both machines adjacent discs rotate in opposite directions, because the gears carrying said discs are directly intermeshed. Whenever one disc is going in a certain direction, the adjacent disc is going in the opposite direction. In the Conner machine, as it is shown in the patent namely, driven by a belt always going one way and connected to give the same direction always to each of the twisters and their spool-carrying discs, the transfer of a spool-carrier from one twister to the next is a transfer from a disc continuously going in one direction to a disc continuously going in another. In defendants' machine the direction of motion of each disc and twister is reversed when the crank motion is reversed, and the transfer of a spool-carrier from the disc of a twister to that of an adjacent twister is a transfer from a disc now having one direction of motion to another having an opposite direction of motion, said opposite direction of motion of the receiving disc being, however, the direction of motion previously had by the disc from which the spool-carrier was taken.

X Q. 127. In the Conner machine the spool-carrying frames
112 are alternately on discs which constantly run in opposite directions, while in the defendants' machine the spool-carrying frames are constantly on discs which run in the same direction. Is not this correct?

A. That is true, as follows from the reversal of the hand crank in defendants' machine explained in my last answer.

X Q. 128. In the Conner machine the automatic switches are never rotated or carried around by the rotating discs, while in the defendants' machine they are constantly carried around by the rotating discs. Is not this correct?

A. It is.

X Q. 129. Do you consider that the Conner machine contains or embodies the inventions called for in the second and third claims of the Davisson patent and in the first, second, ninth, tenth, eleventh, fifteenth and twentieth claims of the Kitselman patent in suit in this case, so as to be an infringement of such claims?

A. I do.

Adjourned to tomorrow morning at 10 o'clock.

CHICAGO, *August* 5, 1898—10 o'clock a. m.

Met pursuant to adjournment.
Present: Parties as before.

X Q. 130. Turning now to the Pope patent sued on, I find that the first claim speaks of regularly spaced openings, and the ninth and tenth claims speak of openings. These openings referred to are simply holes in the upright frame, are they not?

A. All openings are holes, but all holes are not openings. The openings contemplated here is a passage through the frame that will let the tension wires of the fence pass through them (or through a tube in them) from one side to the other.

X Q. 131. I find in the claims of the Pope patent under consideration twister wheels mentioned. These are the wheels marked "G" in the drawings, are they not?

A. They are; the letter G applying to the wheel as a whole and the letter H to the gear teeth around the wheel.

X Q. 132. These twister wheels are provided with T-shaped
113 grooves across their faces, as particularly shown in figure 4 of the drawings, are they not?

A. They are.

X Q. 133. I notice that the claims refer to shiftable spool-carriers. These are the devices shown in figure 5 of the drawings, detached, are they not?

A. Yes, and figure 3 also illustrates them in section.

X Q. 134. These shiftable spool-carriers are provided with T-shaped tongues marked "M" in the drawings, are they not?

A. Yes.

X Q. 135. When the shiftable spool-carriers and the twister wheels are in place in the machine, the T-shaped tongue of the spool-carrier is arranged in the T-shaped face grooves K of the twister wheel, are they not?

A. Yes; that is, the tongue of the spool-carrier movably occupies the T-shaped groove in the twister wheel, except when it is passing from the groove of one wheel to that of another, and then it is partly in both.

X Q. 136. All the spool-carriers on one side of the row of spindles are attached to one bar, and all the spool-carriers on the other side of the spindles are attached to another bar, and these bars are connected by the lever S so that by moving the hand lever one set of spool-carriers is moved up and the other set down. Is not that the operation in the Pope machine?

A. I should say rather that the spool-carriers or side sections on one side are engaged with one vertically sliding bar and those on the other with another sliding bar, the bars being connected by the intermediately pivoted hand lever and reciprocated as described in the question in shifting the spool-carrier from twister to twister.

X Q. 137. These bars are marked "Q" in the drawings of the patent, are they not?

A. Yes.

X Q. 138. In shifting the spool-carriers they slide, or are slid, from one twister wheel to another through means of the T-shaped groove and T-shaped tongue which we have already considered, are they not?

A. The tongue of the spool-carrier slides, or is slid, from the groove of one twister into the groove of the adjacent twister.

114 X Q. 139. In the Pope machine, by which I mean the machine described and illustrated in the Pope patent sued on and embodied in the Kitselman machine No. 2, the twister wheels are provided with T-shaped grooves in their faces, while in the defendants' machine they are not provided with any T-shaped grooves. Is not this correct?

A. The twister wheel of defendants' machine has the essential portion of a T-shaped groove requisite for the kind of holding or supporting of the spool-carriers therefrom contemplated by Pope and attained by him in the construction referred to in the question. As he shows this supporting device in the drawings of the patent, the tongue or projection M on the inner end of the spool-carrier has two laterally projections, which give it the literal T shape, and the recess which he shows in the twister wheel or cross-head wheel corresponds with the tongue in being literally T-shaped. In defendants' machine, the spool-carrier has a cross-plate at its inner end either half of which corresponds with one of the lateral flanges on the projection M of the patent. The insertion of one such flange of a T-shaped tongue behind a surface of a recess in a vertical part will hold the part having the flange as effectively as will two, provided it be strong enough, and will hold it on the same principle of mechanical engagement. This is illustrated in the Pope patent in suit in connection with the brace W shown in cross-section in figure 6. The part W has its end bent at right angles corresponding with either arm of a letter T, this form being technically distinguished from the T form by the term L form. The part U shown in figure 6 of the Pope patent to be engaged by the L-shaped brace W has a recess (called a longitudinal guide-groove V, in the patent), open at the side to admit the L arm of the brace, and the brace is held by its L arm in said recess precisely as it would be held if it had two opposite arms like the letter T, entering two oppositely arranged recesses instead of one. It is only a question of retaining an L-shaped part in its recess as a T-shaped part is held in its recess, so that it shall not be displaced. Defendants' machine, while not having a literally T-shaped groove, does have the equivalent L-shaped groove, and the spool-carrier of the defendants' machine has in either end of

115 its T-shaped head an L arm to enter the groove in the twister wheel, both these being the equivalent of the device actually shown in the Pope patent and mentioned in the question.

X Q. 140. In the Pope machine the twister wheels are provided with T-shaped grooves in their faces, that is, grooves entering the wheels on their flat front surfaces, while in the defendants' machine

they are not provided with any T-shaped grooves in their faces. Is not this correct?

A. It is correct only in the strictest, literal use of the terms and is not at all correct as to the essential mechanical facts. The front faces of the twister wheels in the Pope machine are projected forward beyond the plane of the gear teeth and the recesses or T-shaped grooves are limited to the forwardly projecting portion of the wheel, so that the tongue, moving in the plane of such forwardly projecting portion of the wheel and in front of the plane of the gear teeth, may be slid into the open sides or end of said recess. The tongues are not thrust backwardly into the literal face slots of the twister wheels and said slots are, in function, merely spaces where the connecting shank between the lateral flange of the tongue and the body of the spool-carrier may stand so as to support the spool-carrier from the flange when said flange is back of the metal in the protruding portion of the twister wheel. If one side of said slot should be broken away in the exact construction shown by Pope there would still be the same space or room for the accommodation of the spool-carrier at its connection with the flange and the principle of engagement for upholding the spool-carrier by its rear end only would not be changed at all, but there would not be then, literally, a groove in the front flat face of the twister wheel, that is, a slit with a wall on each side of it. In this literal sense defendant does not have a groove T-shaped or of other form in its front flat surface, as is shown in the Pope machine. But it has the equivalent thereof into which a lateral projection on the rear end of the spool-carrier is inserted from the side, for the same purpose and with the same result.

X Q. 141. In the Pope machine the spool-carrier is provided with a T-shaped tongue, while in the defendants' machine it is not provided with a T-shaped tongue. Is not this correct?

A. No. Pursuing the literalism displayed in counsel's ques-
116 tion, a T-shaped tongue or projection on the rear end of the spool-carrier in defendants' machine is precisely what it has. I refer to the grooved and perforated flange or head secured to the rear end of the shank of the defendants' spool-carrier. Not to be literal, however, but to treat this literally T-shaped head with reference to its use and mode of operation, it is strictly an L-shaped head for the purpose of engagement with either twister wheel, since only one arm of the T is brought into use for that purpose.

X Q. 142. In the Pope machine the twister wheels are provided with T-shaped grooves in their faces or flat front surfaces, and the spool-carriers are provided with T-shaped tongues which enter such grooves in the faces of the wheels, while in defendants' machine there are no T-shaped tongues on the spool-carriers entering T-shaped grooves in the faces of the twister wheels. Is not this correct?

A. As I have already explained, this is literally correct and only literally correct, the defendants' machine having the essentials of the T element referred to in the question, for the same purpose and productive of the same result.

X Q. 143. In the Pope machine all of the spool-carriers on the

respective sides of the spindles are engaged by sliding bars, while in the defendants' machine there are no sliding bars and the spool-carriers are not connected to or engaged by longitudinal sliding bars. Is not this correct?

A. It is.

X Q. 144. In the Pope machine the spool-carriers are transferred from one spindle to another by a direct sliding movement, while in the defendants' machine they are transferred by a rotary movement. Is not this correct?

A. In both cases the movement is equally a "sliding" one. In the Pope machine the direction of such sliding movement is in a straight line, vertically, and in the defendants' machine it is in a curved line vertically.

X Q. 145. In the Pope machine the twister wheels are stationary while the spool-carriers are being transferred, while in the defendants' machine the twister wheels are rotating during the act of the transference of the spool-carriers from one spindle to another. Is not this correct?

A. Not exactly. The statement is true as to the Pope ma-
117 chine, but not exactly as to the defendants' machine. This much is true, however, in the Pope machine the central sections of the twisters, or, in other words, the twister wheels having the recesses in their forwardly projecting parts, are at rest during the whole time of sliding the side sections of adjacent twisters into place therein. In defendants' machine the twister wheels are not at rest during the insertion into their recesses of the flanges on the spool-carrier. They are brought to rest after such full insertion. Then, upon a reversal of the motion of the twister wheel, the spool-carriers are taken up by those wheels into which they have just been inserted and carried away from this point of rest by the wheels with which they have now their engagement.

X Q. 146. In the Pope machine, if we attempt to rotate the twister wheel during the act of transference of the spool-carriers we will frustrate the transference, while in the defendants' machine if we attempt to keep the twister wheels stationary during the act of transference we will frustrate the transference. Is not this correct?

A. Yes.

X Q. 147. In the Pope machine the transference of the spool-carriers is effected by means of a hand lever, independent of the crank for actuating the twisters, while in the defendants' machine the transference of the spool-carriers is effected by the crank for actuating the twisters and not by separate and independent means. Is not this correct?

A. That is correct; defendants' machine having the automatic feature of switching or transferring introduced by Conner.

X Q. 148. Is it your opinion that the Pope machine, if made by an unauthorized person, would infringe the second and third claims of the Davisson patent, the first, second, ninth, tenth, eleventh, fifteenth and twentieth claims of the Kitselman patent and the second and third claims of the Conner patent sued on in this case?

A. It is my opinion that the Pope machine contains the subject-

matter of each of the claims referred to of the Davisson and Kitselman patents, but not those of the Conner patent.

X Q. 149. In your direct examination you several times
118 spoke of "detachable" and "transferrable" spool-carriers. Please explain what you meant by the use of these terms.

A. The only instance now brought to my attention in which the word "detachable" and the word "transferrable" both occur is in my discussion of the Kitselman machine, immediately after quoting the claims of that patent, here in suit. The full statement is as follows:

"It will be observed from these claims that Kitselman embraces in the term 'twister' three general parts, one of which includes the hollow spindle, and each of the others of which includes a detachable and transferable spool-carrier and a spool for the mesh wire mounted rotatably on said carrier. The first of these sections he calls the 'central section' of the twister and the other two the 'shifting sections.'"

The meaning of the word "detachable" seems to me clear and to have reference to the fact that the spool-carrier in each twister may be detached from the central section of the twister for the purpose of being removed or transferred to an adjacent twister, the word transferable plainly having reference to its detachable connection with any central section, and the provision of means by which it may be transferred or shifted from one section to another, or, at least, to a capability for such transfer.

X Q. 150. Let us take the Kitselman, Conner and Pope machines with their hollow spindles or central sections having the spool-carriers in place, and remove one spool-carrier from each twister with, of course, the parts which are required to be removed with it, leaving the spool-carriers and such parts out, and attempt to operate the machine. In the Kitselman, Conner and Pope machines the remaining spool-carriers, with their parts, cannot rotate around the spindles and do their work, while in the defendants' machine the removal of one spool-carrier with its attendant parts from each twister and leaving them out will not interfere with the operation of the remaining one. Is not this correct?

A. I don't think it is. So far as I can see, it is true of all three of the machines mentioned, Kitselman, Conner and Pope, that
119 one or any number of the side sections or spool-carriers may be removed and the remaining ones do their work, as well as in the defendants' machine.

X Q. 151. Let us take the Kitselman, Conner and Pope machines with their hollow spindles or central sections having the spool-carriers in place, and remove one spool-carrier from each twister with, of course, the parts which are required to be removed with it, leaving the spool-carrier and such parts out, and then remove all of the other spool-carriers and their parts except one, leaving them out. In the Kitselman, Conner and Pope machines the single spool-carrier with its parts left in the machine cannot be transferred from one spindle to another throughout the length of the machine and back again, while in the defendants' machine all of the spool-carriers,

with their attendant parts but one, may be removed, and the one left may be transferred successively from one spindle to another throughout the length of the machine and back again. Is not this correct?

A. No. The statement is true as to the Kitselman and Pope, but it is not true of the Conner, and the statement is also true as to the defendants' machine. It is by reason of the employment of the Conner invention that it is possible in defendants' machine.

X Q. 152. Do you mean that this can be done in the Conner machine as described and illustrated in the patent sued on?

A. There would need to be a different adjustment of the switches to bring about this particular extended travel of the single spool-carrier from end to end of the series of twisters, but the possibility is inherent in the mode of supporting and switching shown in the Conner patent, and such modification of the switches for the production of precisely this result in the Conner machine would not involve any change in principle or essential mode of operation, but only in the mere arrangement of switches.

X Q. 153. You have just stated that one of the inherent capabilities of the Conner machine is the ease with which its parts can be adjusted so that one of its spool-carriers can be made to transfer from one successive spindle to another through any given number of spindles. Do you regard the second and third claims of
120 the Conner patent sued on as covering and including such arrangement and adjustment of parts or devices?

A. I happen to have stated no such thing as the question asserts. However, this is immaterial to the query, to which I reply that, in my opinion, the Conner claims in suit would be clearly applicable to the machine with such an arrangement of switches as would give the travel of a single spool from end to end of the machine.

X Q. 154. Is there any model of the Davisson patent or any model of the Conner patent showing the inventions or improvements of these patents by themselves in evidence?

A. There is not.

X Q. 155. As I understand you, the Kitselman machine No. 1 represents the Kitselman patent sued on, and the Kitselman machine No. 2 represents the Pope patent sued on. Is this correct?

A. It is.

X Q. 156. In giving your opinions as to the meaning, scope and effect of the claims selected from the patents sued on how far have you considered the prior state of the art?

A. I have seen mesh-wire fencing made prior to my connection with this litigation; have to some extent examined patents and machines for making other reticulated fabrics, and have looked over the patents set up by the defendants in this case.

Redirect examination by Mr. PARKINSON:

R. D. Q. 157. The cross-examination has called attention to various differences in shape and other details of construction between the defendants' machine and the illustrations of the inventions of

the several patents in suit found in the drawings of those patents. Please state whether or not, in your opinion, any of these differences are material so far as the inventions described in these patents and specified in the several claims to which you have referred in the course of your examination are concerned.

A. In my opinion, they are not material. I will add that no difference has been referred to in the cross-examination that
121 I had not fully taken into account in expressing my opinion originally or in the direct examination.

R. D. Q. 158. Has, or has not, any matter or consideration of any kind been brought to your attention during the cross-examination that would modify the opinion expressed by you in your direct examination concerning the substantial correspondence of defendants' machine to the inventions embraced in the several claims referred to?

A. There has not.

R. D. Q. 159. Referring to your answer 123, do you mean to represent by that answer that the switches of defendants' machine can act at any stage of the revolution after a full revolution? I call your attention particularly to the latter part of that answer.

A. The last sentence of the answer is "They (the switches) act whenever the operator desires after any full revolution." * * * I should have made the statement more explicit and to the effect that they act only upon the completion of a revolution and that the operator may bring them into action on the completion of any revolution.

R. D. Q. 160. Referring, now, to cross-question 151 and assuming that as there proposed, all the spool-carriers and their parts except one were removed from either the Kitselman or the Pope machine (as illustrated in the Kitselman and Pope patents, respectively), are you, or are you not, positive that the single spool-carrier with its parts left in the machine could not be transferred from one spindle to another throughout the length of the machine and back again? In answering this question, I will ask you to consider whether by shifting the sections of such spool-carrier at the proper instant in the revolution, it would, or would not be practicable to shift it throughout the length of the frame.

A. On further examination of the Kitselman machine, I find that all that is necessary to enable a single spool-carrier, alone left in the machine, to be shifted into engagement with all the central sections, one after another, throughout the machine, and to work with them severally in succession, is to remove the limitation now imposed on the vertical slide or slides by which such spool-carrier is carried.

R. D. Q. 161. Assume that the limitations to the movement
122 of the vertical slides remain unchanged and that the single spool-carrier remaining in the machine has been shifted to the spindle next below that which it first rotated about, is it, or is it not, possible by the means existing in the machine to continue to shift it in either direction until it has traveled the length of the frame and rotated about each successive spindle?

A. Yes, that also is possible. On further examination of the ma-

chines referred to, I see that a single spool-carrier, in the absence of others in the machines, can be transferred from top to bottom or from bottom to top and back again throughout the entire length of the machines.

Recross-examination by Mr. BANNING:

R. X Q. 162. Have you intended in your last few answers to withdraw or change your answer to cross-question 151?

A. I intend that my answer to X Q. 151 shall be unqualifiedly, No, and to change the statement which I there made that in the Kitselman and Pope machines this could not be done, while it could be done in the Conner, so that my statement now is that it can be done in all of these machines as well as in the defendants'.

(Signed) MELVILLE E. DAYTON.

ALVA L. KITSELMAN, a witness on behalf of the complainants, being first duly sworn, deposes and says, in answer to interrogatories propounded to him by Mr. Parkinson, on behalf of the complainants as follows:

Q. 1. Please state your name, age, residence and occupation,

A. Alva L. Kitselman; age, 42 years; residence, Ridgeville, Ind.; occupation, manufacturer.

Q. 2. Are you the complainant of the same name in this suit?

A. Yes, sir.

Q. 3. Are you also the patentee of the Kitselman patent here in suit?

A. Yes, sir.

123 Q. 4. Please state whether or not you are engaged in the business of manufacturing and selling wire-fence machines under the several patents in suit, and, if so, under what name and where?

A. I am, under the firm name of Kitselman Brothers, with our factory located at Ridgeville, Ind.

Q. 5. Who constitute the firm of Kitselman Brothers?

A. Alva L. and Davis M. Kitselman, both residing at Ridgeville, Ind.

Q. 6. Please state about when your firm commenced at Ridgeville, Ind., the manufacture of wire-fence machines under the patents in suit, or either of them, stating also whether or not the manufacture has been continuously carried on by your firm since that date to and including the present time, and giving some idea about how extensively you have manufactured and sold such machines.

A. We commenced making what is known as the Kitselman machine or "Complainants' Exhibit Kitselman Machine No. 1," January, 1887, and our Pope machine, "Complainants' Exhibit Kitselman Machine No. 2," January, 1894, "Complainants' Exhibit Kitselman Machine No. 3," September, 1896, and we have manufactured these machines right along from the dates given to the present time, the sale of same being quite extensive throughout the United States.

Q. 7. From the time you begun their manufacture what, if any, effort have you made to advertise and introduce to the trade the machines referred to?

A. Our efforts in that direction have also been very extensive, we having advertised quite extensively in papers throughout the United States and also advertised quite extensively by circulars and pamphlets.

Q. 8. Can you give some idea about how your trade in these machines has increased from year to year since you begun?

A. I have no exact data as to the number of machines sold each year, but our business has steadily increased from probably not over two hundred machines the first year to over five thousand the last year.

Q. 9. Please state whether or not you have been and are
124 prepared to supply the entire demand for such machines throughout this country?

A. We have been and are at the present time.

Q. 10. For what purpose are these machines generally used?

A. For making fences of various styles right in the field.

Q. 11. The fence of what material?

A. Of wire.

Q. 12. At the time you begun to put these machines upon the market or any time before, so far as you know, were there, or were there not machines on the market or in use for making wire fence in the field, that is, for making it where it was to remain as a fixture?

A. There was not.

Q. 13. Have you personally been directly connected with the manufacture and sale of these machines?

A. I have.

Q. 14. So far as you can judge from your experience in manufacturing and selling them, what would you say as to whether they had proved a successful machine in the market and in the field?

A. They have been very successful in both ways.

Q. 15. Do the three exhibits here in evidence as Complainants' Exhibits Kitselman Machine No. 1, No. 2 and No. 3, respectively, correctly represent the different styles of wire-fence machines which your firm has manufactured and sold since it begun the commercial manufacture in January, 1887?

A. They do, with the exception of our having made what is called Kitselman Machine No. 3, in a wood upright instead of as it is made now, that is, we made it for a time on a wood upright, and from that time on as it is shown here.

Q. 16. When you made it with a wood upright instead of metal upright was there any substantial difference in the mechanism of the machine or in its mode of operation from what appears in the exhibit with the metal upright?

A. There was not.

Q. 17. About how long have you been making it with the metal upright as appears in this exhibit?

A. We commenced making with the metal upright in August or September, 1897.

125 Q. 18. When you spoke of beginning the manufacture of this Kitselman machine No. 3 in September, 1896, did you refer to the time when you begun to make the patterns for commercial machine of this style, or to the date when they were actually sold in the market?

A. To the date when we commenced manufacturing the machines, we having commenced making the patterns in April, 1896.

Q. 19. How did the patterns of April, 1896, compare with the machine as represented in this exhibit, so far as the construction and mode of operation for which they are adapted is concerned?

A. The construction and mode of operation are practically the same.

Q. 18. Prior to the time these defendants begun to put upon the market machines substantially corresponding to "Complainants' Exhibit Defendants' Machine," how far had your firm enjoyed the control of the market for machines adapted to weave wire fence in the field?

A. The defendants' machine as shown here is not exactly like the first they commenced to make inasmuch as it was also made on a wood upright, the machine otherwise being the same. Outside of this, we practically enjoyed the exclusive privilege in the sale of these machines.

Q. 19. Did, or did not, the defendants' machine as first put upon the market differ from "Complainants' Exhibit Defendants' Machine" in any respect except the use of a wooden upright instead of a metallic upright of the same general character?

A. It differed somewhat in the manner of the spring-actuated pins, they having a brass spring made from sheet brass similar to the ones now used on the spools through which passed the stationary spindles, the outer ends of said spring resting upon the pins and taking the place of the spiral spring used now in connection with said pins.

Q. 20. Aside from these differences in material and the shape of the spring, were, or were not, these defendants' machines with the wooden uprights substantially the same in construction and mode of operation as defendants' machine here in evidence?

126 A. They were substantially the same in construction and mode of operation.

Q. 21. What opportunities had the individual defendants, or either of them, to become acquainted with your machine of the kind referred to and with the fact that they were made under patents owned by you? I refer to such opportunities as they may have had of becoming acquainted with your machine at or prior to the time defendants' machine first appeared upon the market?

A. The opportunities were good, for Mr. J. H. Srofe and Harry Ward, the former having been in our employ for about seven years in the sale of these machines. He was familiar with our manufacture of these machines and with the entire business as to the manufacture and sale of them, he having had free access to our factory

and office all the time he worked there. Mr. Harry Ward was connected with us in another business, the office for same being in our office, so that he was connected with us in that way for about twenty months, he also having free access to our factory and office and was quite familiar with our business and our manner of conducting same. Mr. John E. Frederick had no knowledge of our business other than what might be gained through talk with others. He, of course, had been in our factory and office quite often, but had no knowledge of the business, so far as I know, than would naturally be gained by any one else having similar opportunities. Mr. Joel Ward had been in our office and factory and knew of the business from its beginning, and was, therefore, familiar with our success in the business. He would naturally also have had the advantage of the knowledge gained of our business by his son Harry Ward when he was in our office. Mr. George W. Frederick had only opportunities similar to Mr. J. E. Frederick for gaining a knowledge of our business. The person Mrs. Kittie Srofe is the wife of Jesse H. Srofe, and, of course, gained her knowledge of the business through what Mr. Jesse Srofe knew of it by his connection with us in the sale of said machines.

Q. 22. At and immediately prior to the time when the defendant company was organized about how near did each of the individual defendants live to the factory where you were manufacturing and selling these machines?

127 A. Mr. John E. Frederick and George W. Frederick lived within about four squares of our factory. Mr. Jesse H. Srofe and Kittie Srofe lived within about five squares. Mr. Joel Ward lived about seven squares, and Harry Ward about eight squares from our factory.

Q. 23. When did the seven years of Jesse H. Srofe's employment in the sale of your machines end?

A. Just prior to his going to Kokomo, possibly sixty days prior to his going to Kokomo. It must have been about the 1st of February, 1896, that he left our employ. He worked for us all the seven years preceding.

Q. 24. About when was the time when Harry Ward occupied the same office with you for twenty months, or thereabouts?

A. According to such records as we have on our books at home, he commenced in our office in May, 1894, and left in January, 1896.

Q. 25. When you speak of your office in this connection, do you, or do you not, refer to the office where you were conducting the business of manufacturing and selling these machines?

A. Yes, sir; I refer to the office where we transact all our business in connection with the manufacture and sale of these machines.

Q. 26. Was this office in the same building with the factory where these machines were made, or, if not, how was it located relative to that factory?

A. It is within about thirty feet of the factory building.

Q. 27. Do you know Theodore M. Conner, the patentee of the Conner plant here in suit?

A. I do.

Q. 28. Do you know what, if any, connection with or employment in the manufacture of defendants' machines he had?

A. To the best of my knowledge he has been their pattern-maker from the start, and I was informed by Mr. Jesse H. Srofe himself that Mr. Conner was making some patterns for him while he (Conner) was living at Fountain City, Indiana, and while Mr. Srofe was still living in Ridgeville.

Q. 29. Did Jesse H. Srofe tell you what the patterns were
128 for? What kind of machine they related to? or for what purpose they were made?

A. He said the patterns they had received from Mr. Whitney needed some alteration or additional gates of patterns, and they were having Mr. Conner do the work for them.

Q. 30. What I want to know is whether Mr. Srofe said anything indicating what kind of a machine the patterns being made by Conner were for or for what purpose these patterns were made?

A. In my former answer I speak of Mr. Srofe saying that Mr. Conner was doing this work for them. At the time he was talking to me about the patterns he held out the idea to me that he had entered into some arrangement with Mr. Whitney for the sale of territory or territorial rights under his patent.

Q. 31. Was there anything said by Mr. Srofe to indicate whether the pattern to which he referred as being made by Mr. Conner related to a steam-engine, or to a plow or to some other kind of machine?

A. They were for a fence machine.

Q. 32. Who do you refer to by the word "them" in the first sentence of answer 30?

A. Mr. Srofe used the word "them," and, as stated before, he held out the idea to me that he had entered into some arrangement with Mr. Whitney for the sale of territorial rights under Mr. Whitney's patent, but it seemed that at that time he had made arrangements with those who were afterwards associated with him in the manufacture of the defendants' machine, so that he undoubtedly had reference to these same parties when he made use of the word "them."

Q. 33. Were, or were not, your machines corresponding to each of the three Kitselman machine exhibits here in evidence publicly exposed for sale at your place of business in Ridgeville from the time you began to manufacture and put them upon the market?

A. They were.

Adjourned to tomorrow morning at 10 o'clock.

129 CHICAGO, *August* 6, 1898—10 o'clock a. m.

Met pursuant to adjournment.

Present: Parties as before.

Q. 34. Was, or was not, your factory generally throughout the time you have been engaged in the manufacture of these machines

open to the public so that the townspeople or others could see what was going on there and what kind of machines were being made?

A. It was open so that any of the townspeople could go there at any time during working hours.

Q. 35. What, if anything, did you in your advertisements and in the markings of your machines to indicate to the public that they were patented machines?

A. We always marked the machines so, and stated in our printed matter that they were manufactured under patents.

Q. 36. Please state whether or not from the time you begun the manufacture of the first style of machine you have marked the same as patented upon all the machines manufactured and sold, and, if so, just how the machines have been marked.

A. We have so marked upon every one of them, on the machines themselves, from the time we commenced their manufacture, giving the dates of the patents.

Q. 37. What besides the date has been marked on them?

A. The words "Manufactured by Kitselman Bros., Ridgeville, Ind."

Q. 28. Has, or has not, the word "patented," as well as the date of the patent been marked on them?

A. It has.

Q. 39. Does, or does not, the Exhibit Kitselman Machine No. 1 correctly represent the style of marking used by you as the machines were first put out?

A. As they were first put out they did not include the dates of the Canadian patent, as marked on the machine exhibit here; otherwise, it correctly represents the way they were marked.

Q. 40. Does, or does not, the Kitselman machine No. 2 correctly represent the marking which you applied to that style of machine when you first begun its manufacture?

A. It does.

130 Q. 41. When, if at all, did you begin to mark all the machines manufactured by you under the Davisson patent?

A. In August or September, 1897; I am not positive which.

Q. 42. Have, or have not, all of the machines of the style represented in evidence as Kitselman machine No. 3 been marked as appears on this exhibit?

A. They have.

Q. 43. To what extent, if at all, have you sold machines of the kind here represented abroad?

A. They have been sold quite extensively in Canada, and we have also shipped machines to South Africa and Australia, and, I believe, several to Mexico.

Q. 44. Have, or have not, the machines been sold in these countries to which you speak of having shipped them?

A. Yes, sir; they have all been sold outright.

Cross-examination by Mr. BANNING:

X Q. 45. Which machine of the three complainants' exhibits in evidence are you manufacturing the greatest number of?

A. The one shown as Exhibit No. 3.

X. Q. 46. To what extent are you now manufacturing the machine as Exhibit Kitselman Machine No. 1?

A. We have quite a number of the standard size on hand, and make them only for special sizes to order.

X Q. 47. Have you not practically discontinued the manufacture of the style of machine shown here as Kitselman machine No. 1?

A. No, sir; not entirely so.

X Q. 48. About how many of that kind do you think that the present year's product will include?

A. That would be pretty hard to tell without I took the pains to look over our books.

X Q. 49. It is an inconsiderable number as compared with the entire number of machines which you make and sell now, is it not?

A. Yes, sir.

X Q. 50. How about machine No. 2 before us? About how many of that style of machine are you now making?

131 A. That is about the same with reference to that shown in Exhibit No. 1. We have quite a number of the standard size on hand, and make them only in special sizes to order.

X Q. 51. Machine Exhibit No. 3, then, is the one which you are particularly pushing at the present time. Is this correct?

A. That is correct.

X Q. 52. After you procured your patent in January, 1887, you say you began the manufacture of the machine. Is that the only way in which you exercised your monopoly or privileges secured by your patent?

A. We not only commenced the manufacture of the same, but the sale of same, as well as territorial rights under said patent.

X Q. 53. What did these territorial rights include?

A. The right to sell and use.

X Q. 54. Did any of them include anything further than that?

A. Some few of the sales toward the last rights that we sold, I think included the right to manufacture.

X Q. 55. As well as the right to sell and use?

A. Yes sir; although just what ones I am unable to say, and they were very few as compared with the whole.

X Q. 56. When you sold territorial right, as you say, the particular territory was specified in the deed, and the right was exclusive in the purchaser, was it not?

A. It was a mere license and exclusive so far as the sale and use were concerned.

X Q. 57. And this was also true, was it not, of those which also included the right to manufacture?

A. Yes, sir.

X Q. 58. In question 12 you were asked whether at the time you began to put on the market a fence machine there were any other machines on the market or in use for making wire fences in the field; that is, for making it where it would remain as a fixture; and replied that there were not. Had you never seen a portable machine for

making wire fences in which pickets or slats were interwoven with the wire in use in the field before your invention?

A. My answer had reference wholly to a diamond-meshed woven-wire fence. I can't say that I have ever seen at work what is
132 known as a slat-fence machine, but I had seen some of the machines and knew of others.

X Q. 59. These machines, however, as I understand you, did not make a diamond-meshed wire-woven fence, while yours does make such a fence. Is that correct?

A. That is correct, in part, only. While our machine makes what is called a diamond-meshed fence, it also makes what would really be called a half-diamond mesh; that is, the diamond is divided by tension wires running through the center of same. This, however, is sometimes called a diamond mesh. The machine, however, is capable of not only making a diamond-meshed fence and this half-diamond mesh, but many other different styles of meshed wire fencing.

X Q. 60. Have you ever manufactured or sold the Davisson machine; by which I mean the machine described and illustrated in the Davisson patent sued on?

A. We have never manufactured and sold that machine except as it may be included in these three machines.

X Q. 61. You say that you began to manufacture and your machine—by which I mean the machine described in the Kitselman patent sued on—January, 1887. Had you done anything toward the manufacture of this machine prior to your application for the patent in August, 1886?

A. Yes, sir; we had done some work on the patterns.

X Q. 62. How early did you begin work on the patterns for the machine of your patent?

A. I am unable at this time to give the exact date, but it must have been as early as June, if not in May, 1896.

X Q. 63. How early did you conceive of the invention described and claimed in your patent of January 18, 1887, sued on?

Objected to as not relevant to the direct examination and not competent in cross-examination; and notice is here given that it will be insisted that as to all matters not relevant to the direct examination defendants' counsel makes the witness his own.

A. I am unable to give the exact date, but it was in the fall of 1885, or the latter part of the year 1885.

X Q. 64. It was after you had seen these portable ma-
133 chines for making the composite fence of wire and pickets or slats that I asked you about in cross-question 58, was it not?

A. Yes, sir; it was.

X Q. 65. You went to Washington personally to make your application for a patent, did you not?

A. Yes, sir.

X Q. 66. After talking there with the counsel that you had selected

you started to return home and then turned around and went back to Washington and made your application, did you not?

A. No, sir.

X Q. 67. What was your object in purchasing the Davisson patent?

A. I was advised by counsel that it would be a very valuable patent to have, and a good one to own and control for our own protection.

X Q. 68. Did you not purchase that patent for the purposes of this litigation, at least in part?

A. Not particularly this litigation. We purchased it for the reasons stated in my last answer, and, of course, for any protection it might afford us.

X Q. 69. You bought it after the defendant company had begun its operations did you not?

A. Yes, sir; I think so.

X Q. 70. Look at this notice which I hand you, marked "Infringement notice" and numbered 5,685, and state whether that was the notice sent out by complainants, together with others like it.

A. It is.

By Mr. BANNING: Defendants' counsel requests that the circular shown to the witness and identified by him be marked by the notary with his name and with this date, for the purpose of identification, and the circular is so marked.

X Q. 71. I see that on the Kitselman Machine Exhibit No. 1 a statement, in effect, that the machine *is* patented in Canada March 1, 1888. Is the Canadian patent similar in its drawings, description and claims to the United States patent sued on in this case?

134 A. Yes, sir; I think they are the same.

X Q. 72. Have you ever had any litigation under your United States patent sued on in this case or under the Canadian patent?

Objected to in so far as it relates to any foreign patent, as incompetent and irrelevant, and the whole question is objected to as not responsive to the direct examination.

A. We ourselves have never had any litigation on our Canadian patent; that is, any suit that we were directly interested in other than simply as a witness. We commenced a suit against a firm known as Edwards & Whitney in May or June, 1894, in the State of New York. As to the exact date, I cannot say, but as the date is a matter of record, of course it can be easily secured.

X Q. 73. Was that suit at the city of New York; or in what part of the State?

A. It was either at Utica or Syracuse, I am not positive which.

X Q. 74. Was that suit ever brought to a hearing?

A. No, sir; I think not.

X Q. 75. Is it still pending?

A. No, sir.

X Q. 76. Do you know whether answer was filed in it?

A. I could not say positively that it was. We had an attorney employed living in the city of New York. All information in regard to the suit, after it was commenced and for a while prior to that time, was by letter. We were informed by our counsel that after suit had been filed the firm of Edwards & Whitney had stopped the manufacture, or the preparation for the manufacture of the machines they were preparing to manufacture, and that he had withdrawn or dismissed the case in such a way that it could be opened up again at any time should they go on with the manufacture of said machine.

X Q. 77. That suit, as I understand you, was under your United States patent of January 18, 1887, sued on?

A. Yes, sir.

135 X Q. 78. As I understand you, there was also a suit under your Canadian patent. Is this correct?

Last objection and notice repeated to this line of examination.

A. Yes, sir; suit was brought by parties to whom we sold the Canadian rights.

X Q. 79. Was not that suit against a party named Cochrane?

A. It was brought against one Adam Cochrane, and others, I think, of the same name, and possibly of other names; I do not know.

X Q. 80. That suit was brought to hearing and was decided in St. Thomas, Ontario, Canada, in November, 1892, was it not?

Same objection and notice, and further objected to because it does not appear that the witness was present at the time judgment was entered, if any was entered, or has personal knowledge of the legal effect or nature of any proceeding had in the case referred to, and because oral testimony concerning the subject-matter of the question is incompetent.

A. I am not prepared to give the date or even the year, at this present time, that the suit was brought to a hearing and decided in St. Thomas, Ontario.

X Q. 81. It was several years ago, was it not?

A. Yes, sir.

X Q. 82. Were you acquainted with the machine that was charged to be an infringement of your Canadian patent in that suit?

A. Partially only prior to the bringing of the suit.

X Q. 83. You saw it and became familiar with it after the bringing of the suit, did you not?

A. I saw it on exhibition at the time of the suit, and at that time became familiar with it.

X Q. 84. You testified as a witness in that suit, as I understand. Is that correct?

136 A. Yes, sir; that is correct.

X Q. 85. Was the machine that was charged to be an infringement in that case the same machine that is manufactured by the Cochrane Fence Machine Co., whose main offices, I believe, are at Ionia, Michigan, and at St. Thomas, Ontario, Canada?

A. I could not say. I have never seen one of the machines that I remember of since the suit mentioned, and no such machine, to my knowledge, has ever been manufactured in the United States.

X Q. 86. Look at this circular which I now hand you, which appears to be a circular of the "Cochrane Fence Machine Co., manufacturers of Cochrane's portable, all-wire-weaving fence machine," and state whether you ever saw that circular or one similar to it before?

This question and the circular referred to therein and this whole line of examination are specifically objected to as incompetent and irrelevant and as not responsive to the subject-matter of the direct examination.

A. Yes, sir; I have seen a circular similar to it.

By Mr. BANNING: Defendants' counsel requests that the circular shown to and identified by the witness be marked with the name of the notary and with this date, for the purpose of identification, and the circular is so marked.

The circular is objected to for the reasons stated in the last objection.

X Q. 87. Do you recognize the machine shown in this circular and the machine that was charged to be an infringement in the suit in Canada as being one and the same?

A. Having never seen one of the machines since the suit mentioned, I could not say positively that this is the same, but I rather think it is.

X Q. 88. What was the result of that litigation, if any?

Objected to for all the reasons stated following question 80.

137 A. The decision was in favor of defendants.

X Q. 89. Have you ever sold any territorial rights under the Davisson patent, the Conner patent and the Pope patent, sued on in this case?

A. None under the Davisson patent, one county only under the Pope patent and one State under the Conner patent.

X Q. 90. Were the territorial rights which you sold under the Kitselman patent sued on in this case for townships, counties or States?

A. Mostly for counties. We sold some townships and I think two or three State rights.

X Q. 91. Were those sales made in written deeds or instruments? or simply verbally?

A. They are what would be called a written instrument, partly printed and partly written.

X Q. 92. In the sale of your machines like the three Exhibits Kitselman Machines 1, 2 and 3 before us have such machines been sold in the territory which you had carved out by your sale of territorial rights under the Kitselman patent sued on, as well as elsewhere throughout the country?

A. That shown as Kitselman Machine Exhibit No. 1 has not been

sold only to those who had acquired the right, while the others have been sold regardless of any right.

X Q. 93. And this notwithstanding your claim in this suit that the Exhibit Machines Nos. 2 and 3 contain and embody the inventions of the Kitselman patent sued on. Is that so?

A. Yes, sir; that is a fact. We were under the impression that the patents secured on these other machines gave us the right to do so.

Redirect examination by Mr. PARKINSON:

R. D. Q. 94. Have any of the persons to whom you have granted local rights under the Kitselman patent engaged in the manufacture of machines?

A. No, sir.

R. D. Q. 95. What State do you refer to as sold under the Conner patent?

A. The State of California.

R. D. Q. 96. Do you, or do you not, mean by your answer
138 58 to imply that you had before putting your machines upon the market seen machines for weaving wire fence in the field with other meshes than diamond mesh?

A. No, sir. I have reference to seeing only what is commonly called a slat-and-wire fence machine. I am quite sure that my machine, as shown here as Exhibit 1, was the first machine ever made that you could take into the field and make a meshed wire fence of any kind, the material used being all wire.

R. D. Q. 97. When you speak in your last answer of the material used being all wire do you mean to imply that the posts are made of wire, or do you refer simply to the material which composes the web of the fence—the material between the posts?

A. I have reference to the webb or material between the posts.

(Signed) ALVA L. KITSELMAN.

GEORGE W. FREDERICK, a witness produced on behalf of the complainants, being first duly sworn, deposes and says, in answer to interrogatories propounded to him by Mr. Parkinson, on behalf of the complainants, as follows:

Q. 1. Please state your name, age, residence and occupation.

A. George W. Frederick; age, 37; occupation, physician; residence, Ridgeville, Ind.

Q. 2. You are one of the defendants in this case, are you?

A. Yes, sir.

Q. 3. At or about the time the defendant corporation was organized, or being organized, did you contribute to expenses incurred, or to be incurred in that connection?

A. No, sir; I did not.

Q. 4. Did you not advance or pay out any money for any matters connected with starting the business for the preliminary expenses?

A. No, sir; I did not.

Q. 5. Did you not assist in the sale of the defendants' machines?

A. Only inasmuch as I have recommended them.

139 Q. 6. You did that in the summer of 1896 when they were first put upon the market?

A. I could not say at what time these recommendations may have occurred; possibly in the summer of 1896, but I could not be positive as to the exact time that I might have done so.

Q. 7. Did you not in the summer of 1896, and subsequently thereto, urge persons who were considering the purchase of fence machines to purchase the defendants' rather than of the complainants?

A. I might have done so, but I could not remember any specific case in which I did.

Q. 8. You do know that you have done so in some cases?

A. Yes, sir; I have.

Q. 9. You had done so in some cases before this case was commenced?

A. Yes, sir.

Q. 10. You had in some cases guaranteed purchasers that if they would take the defendants' machines you would assure them against liability for infringement of complainants' patents?

A. No, sir.

Q. 11. Have you not signed a paper guaranteeing a purchaser of defendants' machine against liability?

A. No, sir.

Q. 12. Are you positive about that?

A. Indeed, I am, that I have not.

Q. 13. Have you never signed any paper guaranteeing purchasers, one or more, against liability if they purchased the defendants' machine?

A. No, sir.

Q. 14. Have you never given such assurance or guarantee orally?

A. No, sir.

Q. 15. Do you know farmers living near Ridgeville by the names of David Mosier and Shepherd Mosier?

A. Yes, sir.

Q. 16. What, if anything, had you to do with selling either of them one of the defendants' machines or inducing them to buy the defendants' machine?

140 A. None whatever.

Q. 17. Did you have any conversation with either of them about it?

A. No, sir.

Q. 18. Did you never sign any paper of any kind guaranteeing them, or either of them, against liability, if they purchased such machine or in the use of such machine?

A. No, sir.

Q. 19. Have you never in any instance signed such a paper in behalf of any one?

A. No, sir.

Q. 20. Have you ever, either directly or indirectly, contributed

any money to the expense of the defendant corporation or of the business carried on by it?

A. No, sir.

Q. 21. Have you never undertaken to contribute or to assume any expense or perform any service for that company?

A. No, except in one particular. I assisted at the opening of a double-entry set of books.

Q. 22. You went to Kokomo for that purpose, did you not?

A. Yes, sir.

Q. 23. About how many times have you been at its place of business in Kokomo?

A. About six times. I would not be positive about the exact number of times.

Q. 24. Have not you some interest, either direct or immediate or contingent, in the stock of that company or in the income or success of that company?

A. I have no interest either direct or indirect in that company, except under certain conditions that exist in a private understanding between myself and J. E. Frederick to remunerate me in case of loss or death of J. E. Frederick. The loss I refer to is money or indebtedness that he has incurred to me individually. He owes me money.

Q. 25. You furnished him money to put into that business, did you not?

A. I furnished him money. I don't know what he did with it. I loaned him money.

Q. 26. When was that money loaned him?

A. At various times.

141 Q. 27. State as near as you can the period within which it was loaned?

A. Within the last year.

Q. 28. Was not some of it loaned in 1896?

A. In July, 1896, was the first. I gave this date after inquiring of my brother when he was married.

Q. 29. The rest was loaned from time to time thereafter, was it?

A. Yes, at various times thereafter.

Q. 30. When was the stock in the corporation given as security for this loan?

A. About six months ago; six or seven months ago; I don't remember the exact date.

Q. 31. Was there not prior to that time an understanding that certain stock in the company was to be held as security for this loan, or held in some way for your benefit?

A. No, sir.

Q. 32. How is that stock now held? Has it been assigned to you or is — held by John E. Frederick in your behalf?

A. It is held by J. E. Frederick. It has not been assigned to me.

Q. 33. What is the agreement or understanding between you and him concerning it?

A. It is a private understanding, not even in writing.

Q. 34. I must still ask you to explain candidly and fully what the nature of it is, what its terms are?

A. The terms of this agreement are, if he is unable to remunerate me for money loaned that this stock will be held by him unincumbered until I am satisfied against loss. Those are the explicit terms of the agreement.

Q. 35. This agreement was made before this suit was commenced?

A. Yes, sir.

Q. 36. Have you contributed anything, or agreed to contribute anything, toward the expense of this suit?

A. No, sir; I have not.

Q. 37. Have you never except by loaning money to your brother incurred any expenses connected either with the purchase of a license obtained by J. E. Frederick, Jesse Srofe and Harry Ward, in 1896, or toward the expenses incurred by them, or others,
142 preliminary to forming the corporation or toward the corporation itself in any respect, direct or indirect, except this loan to J. E. Frederick, of which you have spoken?

A. No, sir.

Q. 38. Have you not, outside of this stock to which you have referred as held by J. E. Frederick to secure you on this loan, any interest, either direct or contingent, in the business of the Kokomo Fence Machine Co. or in its success?

A. No, sir; I have not.

Cross-examination by Mr. BANNING:

X Q. 39. How did it happen that you went to Kokomo and assisted in opening a set of double-entry books for the company?

A. At the request of my brother, who was the secretary and treasurer, and he not having a very extensive knowledge of double-entry book-keeping, and I being formerly a book-keeper, he asked me to assist him.

X Q. 40. You have been asked if you have not urged certain parties to purchase the defendants' machine rather than the complainants'. What was the nature or occasion of this urging, as counsel calls it?

A. It usually occurred when people came to see me on other business, and the matter being brought up, my opinion would be asked, and I usually gave it.

X Q. 41. And your opinion was in favor of the defendants' machine, was it?

A. Yes, sir.

— Q. 42. Have you ever gone out of your way or sought occasion to recommend the defendants' machine over the complainants'?

A. No, sir; I have not.

— Q. 43. I notice that in answer — question 33, it appears that the agreement or understanding between you and your brother is not in writing. As I remember, the words used by you were that it was not on record, and I suggested the words "in writing," suppos-

ing that was your meaning. If the answer to question 23 is
143 not correct as it stands, please correct it so that the facts will appear.

A. I meant by that that it was a private understanding and not a matter of record.

Redirect examination by Mr. PARKINSON:

R. D. Q. 44. Then, as matter of fact this understanding or agreement referred to in answer 33 is in writing, is it?

A. Yes, sir.

R. D. Q. 45. Will you produce for inspection that writing?

A. I have not got that; it is not in my possession.

R. D. Q. 46. In whose possession is it?

A. It is in my father's possession.

R. D. Q. 47. What is his name and where is he?

A. John P. Frederick, Castine, Ohio.

R. D. Q. 48. It is held by him for your benefit, is it not?

A. Yes, sir.

R. D. Q. 49. You could obtain it, if you wish to, could you not?

A. Not except under certain contingencies.

R. D. Q. 50. What are those contingencies?

A. The death of my brother.

R. D. Q. 51. Do you mean that you could not obtain access to the instrument except in the case of the death of your brother?

A. It is in his possession. I could not say as to whether I could obtain access to it.

R. D. Q. 52. Will you request your father to send that writing to defendants' counsel, Mr. Banning, for the purpose of permitting inspection by me if, upon seeing it, Mr. Banning is willing to inspect such inspection?

By Mr. BANNING: Defendants' counsel objects to the question as immaterial, and suggests to the witness that there is no reason why he should make any promises to assist complainants' counsel, unless he so desires, and that, if he thinks best, he may decline to make any promise in reference to the matter.

144 A. I decline.

Complainants' counsel objects both to the instruction and to the refusal of the witness, as improper, and insists upon his right to inspect the instrument referred to, and here, in the presence of the witness and J. E. Frederick, the other witness who has been interrogated concerning the same, as well as in the presence of defendants' counsel, requests that the instrument be produced for the purpose of inspection, or, at least, sent to defendants' counsel, in order that he may, after inspecting it, permit such inspection by complainants' counsel, the question whether complainants' counsel will regard it as necessary to introduce the same in evidence or whether the purport thereof can be so agreed upon by counsel as to avoid the occasion for introducing it, to be then determined. He suggests this course as means of avoiding expense incident to subpœnaing

of the father of the witness, in whose custody this instrument is represented to be.

To this request defendants and their counsel decline to respond.

R. D. Q. 53. You have no reason to suppose that if you and John E. Frederick requested your father to produce that instrument for the purpose of inspection he would refuse to comply with that request, have you?

A. I do not know whether he would or not.

R. D. Q. 54. You have never requested its production and been refused, have you?

A. No, sir.

R. D. Q. 55. When was that instrument executed?

A. I do not know the exact date; about seven or eight months ago.

R. D. Q. 56. Are you a mechanic?

—. ——.

R. D. Q. 57. You do not mean to represent, do you, that you have never recommended the purchase of defendants' machine to any person who had not first asked your advice about it, do you?

A. Yes, sir; that is what I mean.

145 R. D. Q. 58. And are you willing to say that you never have recommended to any person the purchase of defendants' machine without first being asked by that person your advice about it?

A. I mean by that that I have never solicited purchasers for the Kokomo fence machine.

R. D. Q. 59. You have recommended the purchase of that machine to persons who had not asked your advice about it have you not?

A. Not to my knowledge.

R. D. Q. 60. Are you positive that you never have?

A. If I have, I do not remember it.

R. D. Q. 61. To what extent have you, personally, used the defendants' machine?

A. I have never used it.

R. D. Q. 62. Have you ever operated it?

A. No, sir; I have not.

R. D. Q. 63. Have you ever had anything to do with building it?

A. No, sir; I have not.

(Signed) GEORGE W. FREDERICK.

JOEL WARD, a witness produced on behalf of the complainants, being first duly sworn, deposes and says, in answer to interrogatories propounded to him by Mr. Parkinson, on behalf of the complainants, as follows:

Q. 1. Please state your name, age, residence and occupation.

A. Joel Ward; age, 60 years old; occupation, farmer; residence, Ridgeville, Randolph county, Ind.

Q. 2. You are one of the defendants in this case, are you?

A. I believes so.

Q. 3. You own stock in the defendant company, do you not?

A. Yes, sir.

Q. 4. When did you first acquire that stock or any interest in or claim on it?

A. Some time in 1897 I procured a claim. The stock was
146 issued in March, I think, 1898. It was contracted for in 1897 and the stock was issued in 1898.

Q. 5. Had you not at or about the time the company was formed in 1896 an understanding that you were to have stock in it?

A. Merely talked of.

Q. 6. You had promised to take stock in it, had you not, before the corporation was formed?

A. In the event that I decided to take stock. I took the matter under advisement.

Q. 7. When did you first take the matter under advisement?

A. Some time after the organization of the company.

Q. 8. You had an understanding with the men that were getting up the company that you could have stock in it on certain terms before the articles of incorporation were signed, had you not?

A. No, sir.

Q. 9. Did you not have some talk with the men who were getting up the corporation about your taking stock in it before the articles were filed?

A. No, sir, not before the corporation was formed. My son, Harry Ward, is a member of that company, was a petitioner for one-third of the stock. He desired me to take an interest. I did not have, to the best of my knowledge, any talk with any of the balance of the company at that time. I told my son that I would consider this matter and should I conclude later on to take some stock I would let him know, and I did agree to take five shares of stock at $100.00 each. It stood that way from the time that I told him that I would take that much stock until, I think, in March, 1898, when the stock was issued to me.

Q. 10. This talk with your son Harry Ward, in which he urged you to take an interest, occurred about the time the papers for forming the corporation were drawn up and before they had been filed at Indianapolis, did it not?

A. No; it was after.

Q. 11. It was in the spring of 1896, was it not?

A. It was in the summer or fall; I don't just remember which, of 1896, that this talk occurred.

147 Q. 12. And when did the talk occur in which you say you agreed to take five shares of stock?

A. In 1897, some time; I don't remember the date.

Q. 13. Did you not in the spring of 1896 advance some money for the expenses incurred or to be incurred in forming the corporation or in starting the business?

A. Only as an endorser for my son.

Q. 14. You did furnish some as an endorser for your son before the corporation was actually organized, did you not?

A. I say I could not say when I first assisted him in getting money, but it was as an endorser.

Q. 15. You did assist him as an endorser in getting money to meet the expense of starting the business, did you not?

A. I could not say. My impression is it was after the business was started.

Q. 16. Did you not assist him in getting money to put in the business before the articles of incorporation were actually filed at Indianapolis?

A. I think not. I think it was after the filing of the articles of incorporation.

Q. 17. You would not be positive, would you, that you did not assist him in getting money for this purpose before these articles of incorporation were filed?

A. I think they did not have to get any money until after the corporation was formed.

Q. 18. Did you not assist him in getting money to purchase the license under the patent under which he and Jesse H. Srofe and John E. Frederick acquired a license preliminary to forming the company?

A. As I said, I assisted my son in obtaining money after the company was organized, and for what purpose the money was used I can't say.

Q. 19. You knew at the time you furnished this money that it was to be used in connection with starting the business of manufacturing these fence machines, or of preparing to do so, did you not?

A. Preparations were made and the corporation organized and they needed money for the purpose of carrying on the business, and on the request of my son I assisted him in getting the money.

148 Q. 20. Did not some of your own money go to them?

A. Not a dollar.

Q. 21. How was this stock that you afterwards obtained paid for?

A. I paid for it.

Q. 22. When?

A. In the summer of 1897.

Q. 23. Did you pay cash for it then?

A. Paid cash for it then.

Q. 24. Prior to the summer of 1897 had you not advanced any money of your own for any of the expenses connected with this business?

A. No.

Q. 25. Did you not sell a tract of land in 1896, or your interest in a tract of land, and the proceeds go into this business?

A. I sold two acres of land to the township for school purposes; that is all the land I ever sold. The proceeds went into my pocket.

Q. 26. Did not any of these proceeds go ultimately into this business or towards the expenses of this business?

A. The sale of that land went as I said; possibly I might have had more, and when the time came to pay for the stock in the Kokomo Fence Machine Co., I paid it.

Q. 27. Have you not guaranteed purchasers of the defendants' machines against liability?

A. I did not.

Q. 28. Have you never done so?

A. Never did it.

Q. 29. Do you know David Mosier and Shepherd Mosier, living near Ridgeville?

A. Intimately.

Q. 30. Have you never guaranteed either of them against liability for the use of the defendants' machines?

A. Never did.

Q. 31. Did you never sign any paper guaranteeing anybody against liability for the use of the defendants' machines?

A. Never did.

Q. 32. Have you ever sold any of defendants' machines?

149 A. Never did.

Q. 33. Have you ever owned any of them?

A. I have; have got it home now.

Q. 34. When did you first own one of them?

A. I think the first of April last, 1898.

Q. 35. Did you pay for it at the time or receive it in compensation for services?

A. I presume it is charged on the books against me.

Q. 36. You did not pay for it at the time you obtained it or at any subsequent time, did you?

A. No.

Q. 37. When did you first use one of defendants' machines?

A. I had it used in May, I think it was, of this year, 1898.

Q. 38. The defendants' machine to which you refer is a machine substantially like the machine in evidence as "Complainants' Exhibit Defendants' Machine"?

A. Yes, sir.

Q. 39. Did you obtain that machine directly from the defendant company, The Kokomo Fence Machine Co.?

A. Yes, I did.

Q. 40. Do you know Theodore M. Conner, formerly of Richmond, Ind.?

A. I do.

Q. 41. What, if any, position has he with the defendant company?

A. He is a hand in their employ.

Q. 42. In what capacity?

A. I should judge from observation, might say almost everything.

Q. 43. Is he a pattern-maker among other things?

A. Yes, sir.

Q. 44. Has he been employed at the defendants' factory from the time it started?

A. I can't say just when he went into their employ.

Q. 45. You know that he has been there most if not all the time since they started, do you not?

A. All of the time since he commenced work. I don't know when that was.

Q. 46. You know it was some time in the spring or summer of 1896, do you not?

150 A. I think it was.

Q. 47. Do you know where he resided immediately before going to Kokomo to go into that factory?

A. Yes, sir.

Q. 48. Where?

A. Ridgeville, Ind. I am talking about Thompson M. Conner, and my answers have meant Thompson M. Conner.

Q. 49. My question had reference to Theodore M. Conner, formerly of Richmond, Ind., and afterwards of Fountain City, Indiana. Do you know him, and whether he is in the employ of the defendant corporation?

A. I am not personally acquainted with him. I only have such acquaintance with him as has been formed since he has been at work there.

Q. 50. You know that he is employed at the defendants' factory at Kokomo, do you not?

A. That is my understanding.

Q. 51. You do know that he has been employed there since the time the factory started, do you not?

A. Yes.

Q. 52. Are you paying, or have you undertaken to pay, a portion of the expense of defending this suit?

A. No, sir, only as a member of the company.

Q. 53. As a member of the company, you expect to contribute to that expense, do you not?

A. If necessary.

Q. 54. Have you not been employed at the factory of the defendant company in connection with the manufacture of these machines?

A. No, sir.

Q. 55. Have you not spent considerable time there?

A. Tolerably often, as a natural consequence of visiting my son and interested, too.

Q. 56. You have known from the outset what kind of a machine they were making there, have you not?

A. Yes, sir.

Q. 57. And you have been there at the factory quite frequently?

A. Yes, sir.

Cross-examination waived.

(Signed) JOEL WARD.

151 & 152 Circuit Court of the United States, Northern District of Illinois.

ALVA L. KITSELMAN ET AL.
vs.
KOKOMO FENCE MACHINE COMPANY ET AL. } In Equity. No. 9574.

Depositions taken on the part of the defendants, beginning this 23d day of September, 1898, at the office of Banning & Banning, Marquette building, Chicago, Illinois, before Belle W. Barry, a notary public in and for Cook county, Illinois.

Present on behalf of the defendants, Thomas A. Banning, Esq., and on the part of the complainant- Robert H. Parkinson, Esq.

ADAM COCHRANE, a witness produced, sworn and examined on the part of the defendants, in answer to questions by Mr. Banning, deposed and testified as follows:

Q. 1. State your name, age, residence and occupation.
A. Adam Cochrane, in my 70th year, residence Detroit, Michigan, manufacturer.
Q. 2. What is the name of your company or firm?
A. Cochrane Fence Machine Company.
Q. 3. What kind of machines do you manufacture and sell?
A. Fence machines and hay-unloaders.
Q. 4. Did you ever have any litigation in reference to your fence machine?
A. We have.
Q. 5. Was that in Canada or the United States?
A. At the city of St. Thomas.
Q. 6. Do you remember the name of the suit? If so, please state it.

By Mr. PARKINSON: Objected to as irrelevant and incompetent and complainant- here makes this objection to apply to any and all evidence that may be offered concerning any litigation in Canada or elsewhere than in the United States.

A. Risdon *vs.* Cochrane.
153 Q. 7. What patent was that suit on if you remember?
A. It was a patent that had been issued to my wife and son from the Canadian patent office on this machine.
Q. 8. What I mean is, what patent were you sued on?
A. For an infringement on the Kitselman woven-wire machine.
Q. 9. You mean the Kitselman patent, do you?
A. Yes, sir.
Q. 10. That Kitselman patent that you were sued under was a Canadian patent, was it not?
A. A Canadian patent.
Q. 11. You also had a Canadian patent on your machine that you referred to in your answer to question 7 did you not?
A. Yes, sir.

Q. 12. Do you remember the date or number of the Kitselman Canadian patent that you were sued under?

A. I do not.

Q. 13. Have you a copy of such patent at home?

A. I had and I think I have yet.

Q. 14. Have you any objections to sending me the copy of that Kitselman patent if you find that you still have it?

A. I have no objections if I can find it. My impression — that it is in the hands of my then solicitors.

Q. 15. Have you here present a fence machine manufactured by your company like the machine involved in the suit in Canada when you were sued under the Kitselman Canadian patent?

A. I believe this is a fac-simile of it.

Q. 16. Do you mean this machine here present?

A. I do.

Q. 17. If the machine here present differs in any respect from the machine that was claimed to be an infringement in the Risdon suit please point out in what respects it differs.

A. I believe the only difference is the putting in of those pipes in the ends of the disks that we did not then use.

Q. 18. You mean that in the machine involved in that suit these hollow spindles that extend out between the twisters were not present; is that correct?

A. That is correct.

154 Q. 19. In other respects is it the same as the machine involved in the Risdon suit?

A. To the best of my recollection there are no other changes.

Q. 20. You say that you "believe" the machine involved in the Risdon suit did not have these hollow spindles between the twisters. Are you sure that it did not have them?

A. I am sure it had. The only difference is that we now carry the lateral wire out in line with the ends of the twisters instead of as before to the end of the disk. There was always a hollow spindle.

Q. 21. What do you mean by your answer to question 17?

A. I don't quite comprehend it yet.

Q. 22. In this machine here present there are hollow spindles or pipes that extend out from the disks even with the ends of the twisters. Did the machine involved in the Risdon suit have those hollow spindles or pipes or not?

A. It had the hollow disks but not the pipes.

Q. 23. These hollow pipes are screwed into the faces of the disks, are they not?

A. Yes, sir.

Q. 24. Are you manufacturing machines like this one present now?

A. Yes, sir.

Q. 25. How long have you been making them like this one present?

A. We have been making machines since 1892 just like this with the exception of the hollow pipe.

Q. 26. When did you put on the hollow pipes?
A. About four years ago.
Q. 27. Where is your manufactury or place of business situated?
A. At 17 Woodward avenue, Detroit.
Q. 28. Are you selling machines like this one in Canada?
A. Yes, sir.

By Mr. BANNING: Counsel for defendants offers in evidence the machine identified by the witness, and the same is marked, "Defendants' Exhibit Cochrane Machine."

By Mr. PARKINSON: This exhibit and the entire foregoing deposition are objected to as irrelevant and incompetent and without waiving objection or exception thereto complainant proceeds under protest to cross-examine *de bene esse*.

155

X Q. 29. Where was the machine for which you sued in the Risdon case manufactured?
A. In St. Thomas, Canada.
X Q. 30. Where were you living at the time?
A. My home was in St. Thomas, but at the time I was served I was in Manitoba, Canada.
X Q. 31. Are you a citizen of the Dominion of Canada?
A. Yes, sir. I am a British subject.
X Q. 32. Are you a native of Canada?
A. No, sir. I am a native of Scotland.
X Q. 33. What portion of your life has your residence been in Canada?
A. Since 1842 up till January of last year.
X Q. 34. Where is that identical machine that was involved in the Risdon suit?
A. I could not tell you.
X Q. 35. Where was this machine marked "Defendants' Exhibit Cochrane Machine" just introduced in evidence, made?
A. In Detroit.
X Q. 36. When?
A. A few months ago.
X Q. 37. State as near as you can when this exhibit was made.
A. Last spring.
X Q. 38. The Canadian machine which was the subject of that Risdon suit was not marked as this exhibit is marked was it?
A. The words Detroit, Michigan, were not on it or Patented U. S. A., or the number of the United States patent, but I think Cochrane Fence Machine Company was on it and the number of the Canadian patent. To the best of my knowledge and belief the numbers of both patents were on it.
X Q. 39. You are not quite sure whether the words "Patented U. S. A." and the number 432951 were or were not on it, are you?
A. I could not change the answer I have already made.
X Q. 40. Are you positive that there has been no other change between that machine involved in the Risdon suit and the exhibit here except the addition of these hollow pipes projecting out in front of the disks?

A. I think the spool frame is different and yet I cannot
156 point out where the difference lies. I think it is a new pattern; we made it with a view of making it of malleable iron instead of cast.

X Q. 41. Are not there some other difference- besides the change in the spool frame and the addition of these hollow pipes?

A. These plates are smaller and lighter and are now malleable instead of cast iron. (Witness points to the base plate in which the wooded uprights are mounted.) And the castors or wheels are now carried on the inside of the plates instead of as before, on the outside.

X Q. 42. Are you positive that there are not some other. I want to know whether you mean to say that the machine in the Risdon suit was constructed in this respect the same as this exhibit? Whether you are positive that it was so constructed?

A. The lever is different; it is malleable iron and of a different pattern. (Witness here indicates the levers for shifting the parts up or down.)

X Q. 43. Have not these spool tensions been applied since that time?

A. No, we always had a spring there.

X Q. 44. Do you mean to say that the spool tensions and the springs controlling them as shown in this exhibit were the same in that machine that was involved in the Risdon suit?

A. Isn't the spool tension and the spring one and the same thing?

X Q. 45. The spool spring apart from its connection with the other mechanism would not, as I understand it, constitute a spool tension, though the spring is here an element in the spool tension. I want to know whether you mean to say that the machine in the Risdon suit was constructed in this respect the same as the exhibit? And whether you are positive that it was so constructed?

A. I have no recollection at the present time of any change in that particular.

X Q. 46. You would not be positive that there were not changes in that particular would you?

A. No, I would not, but if there were, they were very trifling.

X Q. 47. Were there not some other changes made besides those which you have now enumerated?

A. There is a little change there that comes to my mind now. (NOTE.—The witness indicated the iron piece immediately under the words "Pad. U. S. A.") The levers are attached to this piece for moving the machine forward.

157 X Q. 48. Have not some other changes been made besides those which you have now mentioned?

A. I cannot see or think of any.

X Q. 49. You would not be positive that others have not been made would you?

A. If there are they are very trifling.

X Q. 50. Is your legal residence now in Detroit?

A. Yes, sir.

X Q. 51. How long has it been?

A. Since January of last year.

X Q. 52. Prior to that time you had your legal residence at St. Thomas, Canada, did you?

A. For twenty years.

X Q. 53. Is the Cochrane Fence Machine Co. a firm or a corporation?

A. A firm.

X Q. 54. Who constituted that firm at the time of the Risdon suit?

A. My brother, my son, and my wife.

X Q. 55. Were they all residents of St. Thomas, Canada?

A. No, sir. My son was then a resident of Cleveland, Ohio.

X Q. 56. With that exception were they all residents of Canada?

A. No, sir, my brother lived at Ionia, Michigan.

X Q. 57. The business was carried on under your personal charge at St. Thomas, Ontario, was it?

A. Yes sir.

X Q. 58. Were your brother and your son engaged in other lines of business?

A. No, my brother was engaged in making fence machines at Ionia, Michigan. He was also engaged in the furniture business. My son was secretary for Scofield, Shermer & Teagle, oil manufacturers, Cleveland, and is still in their employ but located now in Omaha.

X Q. 59. Neither your brother nor your son spent much of their time at St. Thomas at your works or office there, did they?

A. No.

Redirect examination by Mr. BANNING:

R. D. Q. 60. The machines which your brother manufactured at Ionia, Michigan, were similar to this one offered in evidence, were they?

A. Made from the same patterns. I desire to explain that
158 when the injunction was served in the Canada case it stayed proceedings at Ionia, also where my brother had just made arrangements to begin manufacturing.

R. D. Q. 61. What was done after the determination of the suit in Canada? Did your brother then begin manufacture at Ionia, Mich.?

A. We just had the one set of patterns and I shipped him castings from St. Thomas and London to Ionia, and he had them put together there.

R. D. Q. 62. Do you mean that after the suit was ended in Canada you shipped him castings to Ionia and that he put up machines at Ionia and sold them there?

A. Yes sir.

R. D. Q. 63. Has this been going on ever since the suit was ended in Canada?

A. Yes sir, up till today.

R. D. Q. 64. Have the complainants in this suit, Messrs. Kitselman, made any objections to the business of assembling and selling the fence machines carried on by your brother at Ionia, Mich.?

A. No sir. My—I want to explain; my brother whom I refer to is now with me in Detroit, and has been from January of last year.

R. D. Q. 65. The business has been transferred then from Ionia to Detroit?

A. Yes sir.

R. D. Q. 66. From a copy of the opinion in the case of Risdon vs. Cochrane which I have here it appears that the Canada suit was decided Oct. 18, 1892. How does this correspond with your recollection of the time when the case was decided?

A. That is correct, I think.

Recross-examination by Mr. PARKINSON:

Complainant makes the same objection and reservation as at the close of the first direct examination.

R. X Q. 67. When do you know of your brother's having first made at Ionia the fence machine to which you refer?

A. I would like to make that answer a little lengthy if you will allow me. The settling of the suit involved considerable length of time. They finally paid me $1700 to stop the proceedings and all costs and by the time I got under way again the winter of 1892 and 1893 was pretty well gone and I prepared some machines to take to Manitoba and also to exhibit at the World's Fair and in the
159 early part of 1893 my brother and I went to Manitoba after having shipped machines there and to the World's Fair and we spent about three months in Manitoba selling machines and then returned to the World's Fair and remained there until the close of the fair, which I think was in November. He began making machines as soon after that as we could make arrangements for so doing.

R. X Q. 68. Do you know where and to whom the first machine made at Ionia like the exhibit here was sold?

A. No, sir.

R. X Q. 69. Do you know when and where and to whom any of the machines made at Ionia were sold?

A. I have no record.

R. X Q. 70. And you have no knowledge of the fact, have you?

A. No, sir.

R. X Q. 71. Are you making at Detroit and selling from Detroit a different style of fence machine from this exhibit, a small hand machine which has to be moved bodily up and down for the different twists?

A. Yes, sir, we have made and sold hundreds of them. But we still make this machine.

R. X Q. 72. How many of these machines like the exhibit are you selling in this country as compared with the number of these small hand machines?

A. During the last six months, not one in twenty.

R. X Q. 73. How many of the machines like this exhibit have you sold in this country during the last year?

A. Well, not to exceed fifty or sixty.

R. X Q. 74. Where were they sold?

A. They were sold all over the country as far West as California and as far East as New York State.

R. X Q. 75. Do you mean by this answer that they have been sold in every State in the country, or merely that they have been sold at remote parts of the country and in various places?

A. They have not been sold in every State, but in a great many of them.

R. X Q. 76. Are you sure that as many as sixty of these machines have been sold within a year?

A. Yes, fifty or sixty.

160 R. X Q. 77. When did you first acquire right under the United States patent No. 432,951?

A. My recollection of that is that the patent for both countries were applied for at one time, but the patent did not issue so quickly in Washington as at Ottawa.

R. X Q. 78. Was patent 432,951 issued directly to you?

A. No, both patents were issued to the same parties, to my son and my wife, and I think my brother.

R. X Q. 79. Was 432,951 issued to your wife and son?

A. Yes, and also think my brother, there were three parties I think.

R. X Q. 80. I find by reference to the Official Gazette that this patent was issued to Edward S. Morgan, assignor of one-half to Jas. McNeal and Cyrus O. Leeson. These are not the names of either your brother or your son, are they?

A. Look at the date. No, sir. The patent was assigned to them afterwards.

R. X Q. 81. Do you know the date of that assignment?

A. No, it would be, I could not give the date. I think it would be in the fall of 1891 or 1892.

R. X Q. 82. Whatever interest your brother or son or wife acquired under this patent was acquired by an assignment in writing, was it not?

A. Yes, sir.

R. X Q. 83. Where is that assignment, if you know?

A. I think it is with my son in St. Thomas.

R. X Q. 84. Do you know whether it was recorded in the Patent Office of the United States?

A. I presume it was, the business was all managed by a solicitor.

R. X Q. 84½. That written assignment would show when your brother, your son and your wife, or either of them, first acquired any right or interest under this patent, would it not?

A. Yes, sir.

R. X Q. 85. Are you sure that you had any interest under that patent at the time you made the machine which was on exhibit in the Risdon suit?

A. Do you mean by that, that we had acquired an assignment from Morgan?

R. X Q. 86. That was what I meant.

A. Yes, sir.

161 R. X Q. 87. Then you wish to be understood as saying that the assignment in writing of this patent, 432,951, to your wife and to your son (perhaps also to your brother) was dated prior to the time you made the machine, which was on exhibit in the Risdon suit do you?

A. Yes, sir.

R. X Q. 88. You are sure of that are you?

A. I got the assignment at Richmond, Ind., before I made the machine at all.

R. X Q. 89. At or about the time that assignment was made were you not informed of a notice from Kitselman Bros. to the parties to whom that patent was granted that if they made that machine in this country they would be held liable as infringers of the Kitselman patent?

A. I never heard of it nor do I believe there is such a document in existence. I never was served with any notice of any kind by Kitselman Bros. in reference to the manufacturing of the machine in question although we have had hundreds of inquiries and notices from intending purchasers throughout the United States as to whether we were not infringing upon the Kitselman machine that made the diamond-mesh fence; that they, the parties to whom I refer, had been forbidden by Kitselman Bros. to purchase machines of that description under penalty of a lawsuit. That is still going on I believe in this country yet. And to put ourselves right before the public we have issued thousands of sheets as a warning to intending purchasers that those from Kitselman Bros. were not founded on facts and that they were done for the purpose of injuring their opponents in that business and I have mailed several of those notices at various times to Kitselman Bros.

R. X Q. 90. Now is it not a fact that you knew at or about the time this assignment was made that such a notice as is mentioned in my last question had been given to the patentees, and is it not a fact that you introduced that notice in evidence in the Risdon suit?

A. I am not aware of it.

R. X Q. 91. Who paid you the $1700 that you mentioned in your testimony?

A. It was my solicitor handed the money to me.

R. X Q. 92. Do you know from whom it came to him? or by whom it was paid?

A. It was paid by the company that was formed and of
162 whom Risdon Bros. formed a part. The other members consisted of John Farley, a lawyer, and John Baird. I think the money was paid by check issued by John Baird.

Redirect examination by Mr. BANNING:

R. D. Q. 93. Was your machine like this exhibit on exhibition at the World's Fair in 1893?

A. We had two of them, one in the Canadian and one in the American exhibit.

R. D. Q. 94. Your operations in making and selling fence machines in the United States were conducted openly and without any effort to prevent Kitselman Bros. or anybody else from knowing what you were doing, were they?

By Mr. PARKINSON: Objected to as leading and otherwise incompetent and irrelevant.

A. Yes, sir; we have advertised machines extensively in the leading agricultural papers of this country, up to the present time, all along, for at least five years last past. No one knows that better than does Kitselman Bros. We never got out any new printed matter but we sent them copies.

By Mr. BANNING: Counsel for defendants offers in evidence a certified copy of the opinion of Mr. Chancellor Boyd in the case or suit of Risdon *vs.* Cochrane, (the exhibit being objected to on the part of complainant as irrelevant and incompetent), and the same is as follows:

"RISDON
vs.
COCHRANE.

Judgment delivered by the Hon. Chancellor Boyd at St. Thomas, October 18, 1892.

I have been pretty well saturated with this case now for two days, and I think nothing would be gained by my reserving judgment. I think these two patents may very well stand; my opinion is that the defendant's patent is not an infringement upon that of the plaintiff. I have to go on the evidence before me, but I think I am bound to give Mr. Farley credit for finding out some points of similarity and advantage in the plaintiff's machine which his own experts have not been able to detect, but I have to go on the sworn evidence. It is admitted that the plaintiff's patent is for a combination; it is not a new machine, but it is a new adjustment of parts to accomplish a given result. There was an attempt made to show that the plaintiff's patent was invalid for want of novelty, and probably if that model,
163 which was drawn from the Quaker City office, had been found to be in public use the novelty of the plaintiff's patent would have disappeared, because you find in that the three parts required to be combined, the hollow spindle carrying the stationary wire, the revolving spools, the up and down movement of these parts to produce the mesh. Those three ingredients you find in that early model, but there was no evidence that that was ever made public, so that as far as novelty is concerned the plaintiff's patent is not impeached. But it is a patent for a combination, and one of the difficulties in such patents is that any person with skill making a different combination, which is either materially or essentially different, or which produces the same result by a simplification of the parts, is able to hold his ground against the combination. The

essence of an infringement of a combined patent is a repetition of the parts of that patent. It may be that if merely colorable changes are made a person would not escape the penalties of such an infringement. But if they are something more than colorable variations then the particular combination of parts is not infringed. The patent consists in the particular combination. Now, to come down to these particular machines; I think we have manifestly a diversity: first, in the position of the parts. That is obvious to the eye. One would say, looking at these machines, that the plaintiff's was the more primitive construction. The other, speaking of the outward appearance, is an improvement on it, by putting it more compactly together, and by adjusting it so that it altogether is more seemly looking. That is what one would say on the first blush. Now, all the improvements that are made in machinery is from one person getting the rude machine of one man and improving on that, but for the purposes of this case it is not necessary for me to say that the defendant's machine is an improvement upon or a better machine than the plaintiff's machine. If he made such a readjustment of parts as not to bring together the same combination, even if the result produced was a worse result than the plaintiff's, still it would not be an infringement of the particular combination. It is not necessary that the change of parts, or simplification of parts, should produce a better result in order to say that there is no infringement. If there is an improvement, then the improved combination would be entitled to a patent. My own impression is that the readjustment of parts in the defendant's machine is such as to entitle him to a patent. First, as to the composition of parts. I was particularly struck by the evidence of Mr. Noxon, corroborated by Mr. Watson in almost every particular. They struck me as giving a clear and satisfactory account of the
164 differences in these machines, and what I have to say is very much drawn from their evidence. The composition of the parts is different; as to the shifting, and the single bar, and the frame, and as to the manner in which the alternating twist is combined, and the position of the spool-carrying parts. The spools in the plaintiff's machine are carried on a cushion attached to a section of the side portions of the internal part of the machine. The defendant's, in opposition to that, are carried on the frame. They are also on the outside of the standard, taking the position they do in the model before me, and the others are arranged internally, and the evidence is that the one could not be thrown outside nor the other put inside without a total readjustment. Then the manner in which the spools are carried in the plaintiff's machine, by being held on the shifting frame, *are* different from the carriage of those parts in the defendant's machine, which is by means of a pin on the crank wheel and shaft. Then an advantage in the defendant's machine is pointed out; the destructive tendency of the action of the side sections in contact with the central sections, so that the tendency is for the sides to go apart, and they are only held together, as Mr. Watson pointed out, by what he called a segmental bracket of the spool-bearing parts. One can see the obviousness of that

when the attention is called to it. There is a tendency to go off in the motion around, and there is at that point much more friction developed in the rotation of the plaintiff's spools than in the defendant's. That being so, there is at that part a greater wear and tear, and one of the witnesses said that was observable in a machine which had been used, that the hollow spindles which should be in line in the plaintiff's machine were disarranged, forming a zigzag, as compared with the other. There was also another matter pointed out with regard to the central shaft. It had three bearings, so that it was stronger and thicker than in the plaintiff's machine. That, I think, appears to be the case. The wire passing the central shaft goes through a thicker tube than in the plaintiff's. There was another matter; that is, there was a difficulty at the outset in the plaintiff getting his machines into proper working order. I am not concerned at present to know whether that is a defect in the description or not, because I do not seek to invalidate the plaintiff's patent, but it is obvious that there was something wrong with the London machines. There had to be a proper space in the two parts forming the one end of the standard, which was not so in the London machines, and there had to be models obtained from the States, and by that means only were they able to make the adjustments so that the spools did not work loose. These are the principal
165 points in which the position of parts is structurally different and work differently, better in some respects in the defendant's machine than in the plaintiff's. Then there is a very striking feature, indeed, that the defendant has by the changes made produced a simplification of the parts. There is no doubt that in the central and side sections there are fewer pieces by some 30 or 40 in the defendant's machine, the plaintiff's machine having some 89 pieces as against 55 in the defendant's. The effect of that is that the result is more economical. It is proved there is a greater weight in the defendant's machine, and therefore a greater strength, and with all that there is a less price, four or five dollars less, by this readjustment of parts, and the less amount of labor required to make the fewer parts. Those are very striking matters in which a benefit to the public is obtained, quite sufficient to justify the granting of the patent, or the simplification of parts for the production of an economical result. There is another advantage, that by this same arrangement of parts, the same number of spools, a fence four inches higher can be made by the defendants. I have indicated now the main points. I might develop them more, but it is of importance for the parties to have this case decided, and I have so clear an opinion that I do not think it necessary to develop it further. I am of opinion that there is no infringement, and that the defendant's patent is a good patent. Judgment will be for the defendants; as far as there is no infringement action dismissed with costs; one set of costs on this issue; as to the issue of the importation no costs to either party. I am not quite satisfied with the explanations given by Mr. Risdon. His evidence before the trial was very damnatory, but I do not pass on it, and give no costs of that to either party. As to all the other issues raised and set off all costs in favor of the

plaintiff; reference as to the damages resulting from the undertaking on the interim injunction, which I now dissolve. The machines should be all forthcoming."

Adjourned until October 3, 1898, at 10 o'clock a. m. at the same place.

166 CHICAGO, *October* 3, 1898—10 o'clock a. m.

Parties met pursuant to adjournment.

Present as before.

It is stipulated and agreed by the parties hereto that the memorandum on letters patent of the United States stating the date at which the application was made shall be considered and treated as *prima facie* proof (subject to correction) that the letters patent on which such date appears was applied for on such date as described and as shown in the drawings attached thereto, and that printed copies of British specifications and drawings of British letters patent may be considered and treated as having been published during the year in which the same appears to have been printed in the memorandum on the cover stating the name of the printer and the year, subject to correction if error be found.

ROBERT H. WILES, a witness produced, sworn and examined on the part of the defendants, in answer to questions by Mr. Banning, deposed and testified as follows:

Q. 1. Please state your name, age, residence and occupation.

A. Robert H. Wiles, age 47 years, residence Chicago, Illinois; occupation patent solicitor and mechanical expert.

Q. 2. Please look at letters patent of the United States No. 289,507, of December 4, 1883, to W. J. Davisson, No. 356,322, of January 18, 1887, to A. L. Kitselman, No. 357,067, of February 1, 1887, to T. M. Connor, and No. 505,607, of September 26, 1893, to J. C. Pope, being the patents sued on in this case, and state whether or not you have examined said patents and understand the machines described and claimed therein.

A. I have carefully examined the patents mentioned in the question and believe that I fully understand the machines shown and described therein.

Q. 3. You have stated that in answering question 1 that you are a mechanical expert among other things, and in answering question 2 that you have studied the patents sued on. I will ask you to state what experience you have had as a mechanical expert, and what experience you have had in the examination and study of letters patent to get an understanding of the construction and operation of the machines illustrated and described in them, and what experience you have had as an expert witness in patent causes in the court and in comparison of mechanical devices to determine the
167 similarities or differences that may exist between them? In answering this ques[illegible] you may state what qualifications, educational and otherwise, you have had to enable you to form and express opinions in reference to the matters inquired about?

A. As a preparatory education I graduated in a course in science at Cornel university in 1874, having taken considerably more than the required work of the course in mathematics and mechanics. In January, 1875, I came West to Freeport, Illinois, where I began the study of law in the office of Hon. Joseph M. Bailey, and in January, 1877, I was admitted to the bar on examination before the supreme court of the State and entered upon the general practice of law at Freeport. During the four or five years succeeding my admission to the bar I remained in the general practice at Freeport, and during that time I had among my clients and acquaintances a number of gentlemen interested in inventions and manufactures, and became thoroughly familiar with the matters in which they were engaged. In the latter part of the year 1881 I prepared and filed for some of these gentlemen a number of applications for patents for inventions; and upon the successful prosecution of these applications other work of the same character came to me to such an extent that within a year or two I gave up the general practice of law and have from that time given my attention entirely to matters pertaining to invention. In the intervening period I have prepared and prosecuted a large number of applications for patents for inventions and have thus become thoroughly familiar with the reading of drawings and the wording of specifications and claims. In the prosecution and amendment of applications, I have necessarily compared the structures set forth in pending applications with other structures of the same classes shown in prior patents or publications and have been obliged to draw claims distinguishing between such prior structures and those set forth in the claims of the pending application. I have made a great number of preliminary searches to determine the probable novelty and patentability of alleged inventions, and have made many careful searches to determine the validity or scope of existing patents. In recent years, I have testified very frequently as a mechanical expert in patent causes, and in so testifying have necessarily compared the claims of patents in suit with prior structures, in order to determine the scope or validity of the claims, and with structures subsequent to the issue of the patents in suit, in order to determine whether or not such subsequent structures contained the inventions set forth in claims.

All this experience has tended to familiarize me with the
168 work of examining and comprehending patents, of comparing their claims with the prior art, in order to fix the scope of the claims, and of comparing the claims with structures alleged to infringe them, in order to determine whether or not such structures contain the inventions defined in the claims; and as a result of this experience, I consider myself qualified to testify as an expert in any suit involving a patent or patents covering mechanical structures.

Q. 4. Please look at the second and third claims of the Davisson patent, the first, second, ninth, tenth, eleventh, fifteenth, and twentieth claims of the Kisselman patent, the second and third claims of the Connor patent and the first, ninth and tenth claims of the Pope patent, sued on, compare them with the art as existed prior to each

of these patents respectively, state your understanding of the meaning and scope of these claims, respectively, and of the inventions or mechanical combinations and structures described in them, and compare them with the defendants' machine offered in evidence and state whether or not you find in the defendants' machine the combinations or structures called for in the claims of the patents sued on to which your attention is called, giving any reasons that you may desire for any opinions that you may express.

A. All four of the patents in suit relate to improvements in machines for the manufacture of what may be called a diamond-mesh fabric of wire of the general character illustrated in Figs. 1 of the Davisson patent, Figs. 1 and 11 of the Kitselmon patent, Fig. 2 of the Connor patent, and Fig. 2 of the Pope patent. It will be noticed on examining these drawings that in certain of the forms thus illustrated, the diamond-mesh or body portion of the fabric has parallel longitudinal tension or warp wires at its margins only, while in other forms, the body of the fabric includes other tension or warp wires, parallel to the marginal wires and passing through the intersections of the woof wires which make up the diamond meshes, the woof wires at each such intersection being intertwisted with each other and wrapped about the warp wires. This difference of structure in the product is wholly immaterial, not only so far as the matter of invention in the product itself is concerned, but so far as it requires any material difference in the machine by which the fabric is made; as it will be apparent in examining the various structures pertinent to this suit that no invention could be required in adapting a machine for the insertion of warp wires between the margins of the fabric, the machine being already so constructed as to make the fabric with the tension wires at its edges.

169 In either of the forms above referred to, the fabric in question was old and well known and was the subject of manufacture by machinery long before the date of the Davisson patent, the earliest of the four patents in suit herein. One of the earliest instances of the published illustration and description of such a fabric, together with the machine for making it, is to be found in British patent No. 1285 of 1854, to John Whitehead, for a machine for weaving wire netting; and further early illustrations of the same fabric appear in U. S. patent No. 10,743, issued April 4, 1854, to John Nesmith for improvements in machines for making wire netting, U. S. patent No. 209,520, issued October 29, 1878, to Caleb K. Sawyer, for improvements in wire-holders for making fence cable, U. S. patent No. 218,323, issued August 5, 1879, to Isham Sedgwick for improvements in wire-twisters, and letters patent of the United States No. 233,033, issued October 5, 1880, to Isham Sedgwick, for improvements in wire-twisting machines.

In the British patent to Whitehead and the Sawyer patent No. 209,520, the diamond-mesh fabric is illustrated as not, provided with the warp or tension wires interposed between its edges; in the Nesmith patent No. 10,743, the fabric, as shown, has marginal tension or warp wires, without the interposed warp wires passing through the diamond-shaped meshes, although the description of the machine

shown in the Nesmith patent clearly establishes the capability of the machine for inserting such intermediate warp wires in the fabric; and the two Sedgwick patents No. 218,323, and 233,033, describe the fabric made by the machines of the respective patents, as having edge wires and intermediate tension wires, if the latter be needed. There was, therefore, evidently nothing whatever new in the fabric produced by the Davisson machine, or in the diamond-mesh fabric produced by any of the other machines in suit; nor was it new at the date of the Davisson invention to make such a fabric by machinery having automatically operated parts for the movements of the wire necessary to form the diamond meshes of the fabric, whether the same were combined with marginal longitudinal tension wires only, or with other tension wires interposed between such marginal wires and passing through the intersections of the meshes.

It will be seen from an examination of the fabric made by any of the machines thus far referred to that each of the woof or filling wires making up the diamond-shaped meshes runs in a zigzag course from end to end of the fabric, its general direction being the same as that of the warp or tension wires, through it is constantly de-
170 flected to form a boundary line between two adjacent sets of meshes. In this zigzag course the wire is interwisted alternately with the two wires contiguous to it but lying on opposite sides of it, the twist of the particular wire in question, at the ends of all the meshes, being with the wire at one side of it, and its twists at the sides or side angles of all the meshes being with the wire on the opposite side of it. This peculiarity of structure evidently necessitates a lateral shifting, as well as a twisting movement of all the woof wires; and the providing of means for effecting such motion of translation, as well as the necessary rotation, was the first step in the development of machinery for making this diamond-mesh fabric—a step that was taken more than a quarter of a century before the issue of the Davisson patent, the first of the patents sued in this case. This step, or its embodiment in machinery, is illustrated in various patents prior to the Davisson; but I will refer more particularly to the British patent No. 1285 of 1854, above mentioned, not only because it is of early date, but because its drawings illustrate very clearly the structural nature of the fabric, as well as the construction of the parts designed and adapted to effect the two motions of translation and rotation above referred to.

In the machine of Whitehead, which is shown in the British patent, the operating parts are supported in a rectangular frame of such height as to conveniently receive a series of long wire-wound vertical spindles, the wire on these spindles being adapted to form the diamond-shaped meshes of the fabric. Each of the spindles is seated, at its upper and lower ends, in sockets in semicircular disks supported in corresponding semicircular recesses in longitudinally moving bars near the top and bottom of the frame. These longitudinally movable bars, which are the shifters of the machine, are arranged in pairs at the top and bottom of the frame, the inner recessed edges of the bars of each pair being in contact, so that when they are properly adjusted the semicircular recesses in the meeting edges of the bars

register with each other to form circular openings, as clearly shown in plate 2 of the drawings of the patent. As each of the semicircular recesses contains a semi circular disk, and as each of the upper shifting bars is moved simultaneously and equally with the one directly below it, it follows that when the upper shifting bars are adjusted to a given registration of their semicircular openings or recesses, such as is shown in plate 2 of the drawings, the lower shifting bars are in the same adjustment; and this implies that in each of the circular openings in the upper shifter two of the semicircular disks will be in registration to form a complete circle, a corresponding pair of semicircular disks will be in like connection in the lower shifter, and two of
171 the wire spindles, supported by the pairs of half disks thus brought into registration, will lie side by side, in a plane transverse to the plane of the frame of the machine. Each of the upper half disks is provided with a half pinion; and whenever any two half disks are in registration to form a complete circle, as described, the two half pinions thereon are in like registration, to form a complete pinion. A longitudinally movable rack is so placed as to engage all the pinions so formed; and means are provided for imparting reciprocating movement to the shifters and to the rack. Each of the upper half disks, with its half pinion, is perforated vertically to permit the passage through it of the wire from the corresponding spindle; and above the disks and gears is a take-up roller adapted to receive the ends of the wires and also to draw forward the fabric, step by step, as it is formed, suitable crank mechanism being provided for the rotation of the take-up rolier.

It will be seen from an examination of the drawings of the Whitehead patent, and a consideration of the above explanation and description, that the wire-supplying spindles are mounted in half disks at their upper and lower ends, the two sets of disks being supported in shifting bars adapted to effect such readjustment of the half disks as to bring each half disk alternately into registration with two half disks in the opposite shifting bar, thereby mating each wire spindle, first with one spindle of the opposite shifting bar and then with the next spindle thereto; that the reciprocation of the tooth rack, working in engagement with *with* the gears made up of the half gears of the upper half disks, rotates the gears and with them the disks and spindles, thereby intertwisting the wires; that the repetition of this operation of twisting, with the half twists and the half gears in their alternate positions of adjustment, intertwists each wire alternately with two other wires continguous to each other in the opposite set; and that, since the spindles are so supported and moved by the half disks as to pass by or around each other in a movement corresponding to the movement of the wires in the forming of the fabric, all these operations are effected without any possibility of twisting or tangling of the wires below, or in rear of the half disks which actually perform the twisting of the wires.

Each of the upper half disks, with the corresponding lower half disk and the wire-wound spindle supported between them, may be considered and termed a transferable and rotatable spool-carrier, of the type in which the carrier is supported at both its ends; and it

will be seen, in the further consideration of this general subject, that these devices in the Whitehead machine correspond ex-
172 actly in function, purpose and general mode and means of operation to the traveling spool-carriers of the machine shown and described in the patents in suit. In fact, the shifting devices which support the half disks forming the ends of the spool-carriers in the Whitehead machine, and transfer them, for the purpose of remating them, will be seen to be substantially the same as the shifting devices in the Kitselman and Pope patents sued on herein.

The Whitehead machine of the British patent of 1854 is a very full and clear illustration of the embodiment in a machine of the first and fundamental step required in the development of the art of making this peculiar diamond-mesh wire fabric by machinery. The same general structure is shown, though not so fully, in the United States patent No. 209,520 of October 29, 1878, to Sawyer, one of the patents already referred to.

In the patents of Whitehead and Sawyer no provision is made for supporting and feeding forward longitudinal tension wires, either at the margins of the fabric or at points between the margins; the Sawyer patent being silent as to any necessity for such tension wires, although it was well known long before the date of the patent, and the Whitehead British patent of 1854 containing a statement that the outermost woof wire, during each operation or rotation of the parts, may form a selvege. The next step in the development of the machine, as it now exists, was the addition to the traveling spool-carriers of wire-supporting centers having no motions of translation but adapted to engage with or be engaged by the traveling spool-carriers in such a way as to permit, or assist in the rotation of the spool-carriers during the twisting of the wires and to permit the bodily movement of the spool-carriers required for transferring them for the purpose of reorganizing them into pairs, the function of the wire-supporting centers being to hold in proper relative positions the parallel tension or warp wires passing through them, and axial perforations being formed in these wire-supporting centers for the passage of the warp wires. The earliest embodiment in a machine, of this new and added feature of construction, so far as I know, is illustrated and described in U. S. patent No. 10,743, issued April 4, 1854, to John Nesmith, this being one of the patents which I have already referred to as illustrating the fabric for the manufacture of which the machines shown and described in the patents in suit are intended. The machine shown and described in the Nesmith patent comprises two separate but synchronously operated parts, which are termed in the patent the "feeder" and the "twister," though the feeder might as appropriately be termed a twister, and the "twister" of the patent might more appropriately be called a reducer. The Nesmith ma-
173 chine, like the Whitehead machine shown in the British patent of 1854, and like the Davisson and Connor patents in suit, was what may be termed a loom, as distinguished from the Kitselman and the Pope machines—that is, the machines of Whitehead, Nesmith, Davisson and Connor were all stationary machines

adapted to produce a fabric of the kind described and wrap it about suitable rolls, whereas the machines of Kitselman and Pope are intended for use in the field, the wire netting being made in the position in which it is to remain for use. In a loom, space and weight are of no special consequence as compared with convenience and capacity; and in the machine of Nesmith, as well as in later machines of the loom type, means were provided for giving greater space for the travel of the spool-carriers than could be allowed within the limits of width of the fabric to be formed. For this reason, the "feeder" of the Nesmith machine has the space between the centers of rotation of its spool-carriers greater than the space between the centers of the rotating twisters of the second section, or "twister" of the machine, the result being evidently to secure the increased space for the spool-carriers which was the only object of this duplication of the parts of the machine. Disregarding the necessity or desirability of securing such extra space for the rotation of the spool-carriers, the "feeder" of the Nesmith machine is in itself a complete device for supporting the tension or warp wires and supporting, rotating and shifting the woof wires, it being assumed that the "feeder" when thus used, is provided with a take-up roll like that shown in the patent as mounted on the front end of the forward section or "twister" of the machine. As the parts of the "feeder" of the Nesmith machine are capable of performing all the functions of supporting, transferring and twisting the wires, I will call attention briefly to those parts, as they are shown and described in the patent.

The "feeder" of the Nesmith machine comprises a rectangular frame shown in top plan in Fig. 1 of the drawings of the patent, inside elevation in Fig. 2, and in front elevation in Fig. 3, together with operating mechanism supported upon the frame. At the front and rear of the frame are suitably mounted gears E E E E E, X X X X X, the five gears E E, etc., at the rear of the frame being in successive engagement and the gears X X, etc., being likewise in successive engagement; and gearing is provided for simultaneously rotating the series of gears E E, etc., and the series of gears X X, etc. The gears of one series are directly in front of the corresponding gears of the other series, so that the same axial line is common to the two gears of each pair, one being at the front and the
174 other at the rear of the frame. The drawings show no perforations in the gears; but the specification states that the border wires of the netting are placed on reels C C, supported on the frame of the machine, as shown, and are then passed through holes drilled in the center of the outside gears E E, X X. The specification also states (at the top of the second column of page 1) that "any width of the netting less than the whole scope of the machine can be made by simply drawing in the number of wires desired," and this plainly implies that the other gears, as well as the outermost ones, are centrally perforated for the passage of such "border wires," in case it is desired to make a narrower fabric, whereby gears between the ends of the series become for the time being the outermost gears in use. At any rate, the outermost gears E E, X X, being

perforated, it could involve no invention to perforate the intermediate gears, for the purpose of admitting tension wires, whether at the margins of the fabric, or at points between, the operation of the twisting mechanism and of the whole mesh-forming device being precisely the same, whether the intermediate warp wires be inserted or omitted.

The gears E E, X X are not only centrally perforated, but each of them is formed with two diametrically opposite radial slots extending inward from the margin sufficiently to form recesses which receive the ends of spool-carrying frames, each carrying a woof-wire spool, the front end of each spool-carrying frame being seated in the marginal slot of one of the gears X and its rear end in the corresponding slot of the corresponding gear E E. The bearings which support the gears X X, etc., at the front end of the frame, are open laterally; and it is evident that when all the gears and their spindles or hubs are so adjusted as to bring the diametrical slots into the same horizontal line (as shown in Fig. 3 of the drawings), any spool-carrier may be transferred from its supporting gears to the next adjacent gears to those which support its front and rear ends. It is evident that when the spool-carriers of the machine are arranged in pairs on the alternate gears of the two sets E E, X X, the rotation of all the gears will rotate each pair of spool-carriers about a common axis; and that if the two spool-carriers on one pair of gears E X be shifted in opposite directions to the two pairs of gears E X on opposite sides of the pair previously forming the support of the spool-carriers, a reassembling or remating of the spool-carriers will thus be effected, and that the next rotation of the gears will rotate each newly formed pair of spool-carriers about a common axis coincident with the axis of the supporting gears.

As a means of transferring the spool-carriers, the machine is provided with "shippers" S. S. S. S. and V. V. V. V., together with means for sliding them vertically, one of the shippers being adapted to transfer the spool-carriers in one direction and the other being adapted to transfer them in an opposite direction, or back to their position. One of these shippers lettered S S is shown in Fig. 4 of the drawings; and while the other is not shown, its form, necessary to effect the function described in the patent, is easily deducible. Each of the shippers consists in a series of wedges supported in a suitable frame and having inclined faces adapted to impinge upon the side faces of the end portions of the spool-carrying frames, the corresponding faces of the wedges being oppositely inclined, in order to impart to them the reverse movements described. The Nesmith machine, as illustrated, has five gears at the front and five gears at the rear of the frame—that is, there are, in effect, five rotating centers, since each gear in the front series, together with the corresponding gear in the rear series, acts as a single rotating part or centre. It will be understood, therefore, that in the Nesmith machine there are four spool-carriers, the number of spool-carriers in any of these machines, (as will be seen by examining the patents in suit, for instance), being necessarily one less than the number of centers in use. The "shipper" S, shown in Fig. 4, has its two up-

wardly projecting wedges so formed as to be moved upward between the first and second gears of the series and between the third and fourth gears of the series, it being understood that there are two shippers of the same form, one at the front and one at the rear of the frame; and the wedges of the shippers V V are so formed that one of them is interposed between the second and third spool-carriers and two others impinge upon the outer faces of the first and fourth spool-carriers, both at front and rear.

The spool-carriers of the machine thus described being provided with spools and the spools wound with the woof wire, the ends of the woof wires are carried through perforations in the front ends of the spool-carrying frame, or "stands," as they are called in the specification of the patent. The tension or warp wires being wound upon the spools C C at the rear of the frame and their ends carried through the central openings in the gears E E, X X, the machine may evidently be operated by alternately rotating the gears E E, X X and shifting the spool-carriers supported in the gears, by operating the "shippers" in the manner described. In this operation of the machine, the number of locating centers being five, and the number of spool-carriers four, the distribution of the spool-carriers will be such that in one rotation of the centers, the two outer-
176 most centers will each support a single spool-carrier and the central rotating center will support two spool-carriers, while in the next succeeding rotation the outermost centers and the central one will be empty, the four spool-carriers being arranged in two pairs, supported on the second and fourth rotating centers, counting from either end of the machine. The rotation of the gears, when the spools have the first arrangement just described, will wrap the outer woof wires about the marginal warp wires and will intertwist the other two warp wires at the center of the machine, or of the fabric; and the rotation of the gears after the spool-carriers have been shifted to the second and fourth rotating centers, will intertwist the first and second wires in front of the second center and the third and fourth wires in front of the fourth center. The repetition of the operation thus described must evidently form the fabric shown in Fig. 1 of the Nesmith machine.

There has been presented for my examination a model of what Nesmith calls the "feeder" of his machine, that being the structure which I have just described. This model corresponds exactly to the machine shown in the patent, so far as the rotating centers, the spool-carriers and the "shippers" are concerned, with the slight exceptions to which I shall call attention; but in this model, the means for operating the rotating centers and the reciprocating shippers are such as may be readily operated by hand in such a way as to give the parts the same movements described in the patent. It will be seen from an inspection of this model that the parts have precisely the movements which I have explained as described in the patent. The two sets of corresponding gears at the front and rear of the machine are arranged precisely as shown in the patent, the gears of each set being in successive engagement, so that the rotation of one rotates the others; and the gears on the shaft

provided with a crank impart the necessary rotation to the gears of the two sets. The gears are all centrally perforated; and as I have already pointed —, these perforations are not shown in the drawing of the patent, but their necessity is clearly stated in the specification. The gears are all radially slotted, in exactly the way shown and described in the patent; and the spool-carrying frame with the spool-carriers are supported in the rotating gears or centers, precisely as set forth in the patent. One pair of the shifters in the model conforms exactly to the illustration of the shipper S shown in Fig. 4 of the drawings of the patent; and the other pair of shifters, while not shown in the drawings of the patent (as I have already stated in considering the machine shown in the patent) has the form evidently required for effecting the purpose of the shippers V V as described in the patent. The central wedge
177 of each of the last-named shippers of the model has a central vertical slot adapted to permit it to operate, when a warp wire is passed through the two central gears at the front and rear of the model; and these slotted wedges illustrate the construction that would be necessary at each axial line of the rotating centers, in order to adapt the model to carry longitudinal warp wires at the axes of all the rotating centers. No such vertical slots are shown in the drawings of the patent; but they are evidently necessary, if the width of the fabric is to be less than that provided for by the entire width of the machine—that is, if warp wires, or longitudinal tension wires are to be inserted in the different rotating centers.

In this connection, I desire to call attention to the fact that in the two Sedgwick patents, No. 218,323 of 1879, and No. 233,033 of 1880, both earlier than the Davisson patent in suit, which bears date of December 4, 1883, the same shifters or shippers are shown as those in this model of the Nesmith machine, with the exception that all the wedges are longitudinally slotted to permit them to pass the warp wires carried by the different rotating centers. There would, therefore, have been no invention, at the date of the Davisson patent, or application, in substituting the shipper of either of the Sedgwick patents for the one shown in the Nesmith patent, if such substitution should be deemed necessary in order to adapt the Nesmith machine for the insertion of warp wires between the edges of the fabric—that is, if it should be held that the slotting of the wedges of the Nesmith shippers for such purpose could involve anything more than mechanical skill, in view of the explanation and description of the machine in the Nesmith patent.

It will be seen that while the Whitehead machine of the British patent of 1854 embodied the combination with a suitable supporting frame, of geared semicircular or semicylindrical disks or spindles supporting spool-carriers and spools and adapted to be arranged in pairs so as to form complete geared spindles, together with means for rotating the spindles and spool-carriers and means for readjusting or shifting the half spindles so as to remate them into pairs, the Nesmith machine added to these elements the new and further element of non-shiftable centers adapted to support and permit the passage of warp or tension wires, and likewise adapted to engage and

support the spool-carriers in their different positions of adjustment, the rotation of the non-shiftable centers being adapted to rotate the spool-carriers. All this was done almost thirty years before the date of the Davisson patent, the oldest of the patents in suit herein; and

I desire to say, at this stage of my deposition, that the Nes-
178 mith patent, broadly considered, shows and describes every substantial feature of the working mechanism of a machine of the class under consideration, and that no one of the patents in suit shows or describes any part, pertaining to the actual construction of the diamond-mesh fabric, except such as correspond in general function to the parts of the Nesmith machine. Each one of the machines shown and described in the patent in suit consists in substance of a suitable frame, a series of rotating parts not shiftable laterally, a series of spool-carriers adapted to be arranged in pairs on said rotatable parts or centers and to be rotated therewith, and means for shifting the spool-carriers, so as to rearrange them in pairs with reference to the rotatable centers; and all these parts are found in the Nesmith machine. It is true that the patents in suit show different forms of rotating centers or spindles, as they may be variously termed, and that the forms of the spool-carriers and the means for connecting them with the rotating centers or spindles and of transferring them from center to center are also varied in the different machines shown in the patents in suit; but all these changes are simply differences of construction and arrangement for accomplishing the same result in substantially the same general way—sometimes by the employment of novel details of structure, and sometimes by the mere application or modification of well-known shifting mechanisms. In view of the Nesmith patent, each of the patents in suit is merely for changes or improvements upon the essential features of construction of the Nesmith machine; and the claims of each of the patents in suit must be construed, in view of this fact, and not on the supposition that it is in any sense a pioneer patent in the art to which it relates.

Another patent of earlier date than the patent to Davisson, describing the fabric for the making of which the Nesmith machine and the machines of the patents are adapted, is the British patent No. 2516 of 1876. The specification of this patent is extremely brief; and the simplest explanation of the disclosure of the patent will be found in quoting the entire specification:

"My invention relates to certain improvements in the manufacture of wire netting, and in the machinery to be employed therein, the object being to produce a stronger netting than the present, which is liable to bulging and fracture by the action of sheep and other animals.

The improvements consist in forming in the general work or process a series of strengthening wires, either single wires or compound, or cable wire, the same passing alternately through the twists and

meshes so as to prevent the netting from stretching or break-
179 ing. These wires of course run parallel with the direction of the work, and are secured by being surrounded and gripped by every twist of the mesh. They may be applied through all the

meshes or through alternate meshes, or in sheep netting through as many series as required.

I supply to the lower part of the machine feeding bobbins, supplied with the wires or cables, which pass up to the work in suitable guides, and I cut a space out of the center of one of the halves of the twisting wheels (which are always made in two parts) so that my wires shall pass through; then when the divisions of the wheels are carried apart by the ordinary sliding bars my wires are pushed by guides out of the spaces in the wheels into slots in one of the sliding bars about midway between the turning wheels and on the opposite side of its half wheel, so that my wire may be held while the twist is made, and they are thus relieved from the action of the twisting wires which form the mesh. Or I divide the twisting wheels into three parts, my extra wire passing through the central division, and the two side segments travel to and fro to form the twist, leaving the central division in position with my supplementary wire therein maintained.

For cattle fences, which are required of great strength, this invention will be of especial application, and for garden and house fencing, where finer work is required, the article will prove much stronger than the ordinary netting."

Adjourned until tomorrow morning, October 4, 1898, at 10 o'clock a. m., at the same place.

CHICAGO, *October* 4, 1898—10 o'clock a. m.

Met pursuant to adjournment; present as before.

Mr. Wiles, resuming his deposition, said:

This British patent of 1876, which is for "improvements in the manufacture of wire netting and in the machinery to be employed therein," not only clearly describes the fabric having the meshes and the longitudinal strengthening wires passing through the twists and meshes, but it briefly describes two ways of constructing the twisting and shifting devices, one of which is extremely interesting and pertinent to the issue in this case. The references in the specification to the twisting wheels "which are always made in two parts," and the "ordinary sliding bars" by which the wheels are shifted, evidently points to such a construction as that shown in the Whitehead British patent of 1854, already fully described. The specification suggests two modifications of the old construction, the first modification so described, not being of special interest in its bearing on the present suit; but the second modification is
179a extremely important. I refer to the one described in the following language: "Or I divide the twisting wheels into three parts, my extra wire passing through the central division, and the two side segments travel to and fro to form the twist, leaving the central division in position with my supplementary wire therein maintained."

In view of the Whitehead British patent and the construction clearly shown therein, and evidently referred to in this British patent of 1876, the meaning of the passage just quoted is perfectly clear.

It evidently describes a construction in which each of the twisting and shifting wheels or gears, instead of being divided into two parts, as in the Whitehead machine, is divided into three parts, two of which are adapted to move laterally, while the third remains stationary, so far as bodily movement is concerned. The description does not merely describe each twisting wheel, however, as divided into three parts, but specifies them as being a "central division" and "two side segments," and states that the central division remains in position with the supplementary (or longitudinal) wire maintained therein, while "the two side segments travel to and fro to form the twist." Furthermore, it is evident, from the entire specification, that these "side segments" are to be moved to and fro by what are spoken of in the specification as "the ordinary sliding bars," these being evidently the parallel shifting bars, in substance, of the Whitehead machine, each bar being formed on its inner edge with recesses conforming to the segments and adapted to move them to and fro, and at the same time to form bearings for the rotation of the complete twisting wheels resulting from the registration, or assembling of a central section and two side segments.

The modification thus set forth is not only of general interest, as embodying the combination with central non-shiftable parts or spindles for the passage of main wires, with laterally shiftable woof-wire twisters adapted to pass back and forth between contiguous centers and to be rotated with such centers; but it is of particular interest, in its bearing upon the patents of Kitselman and Pope, as will be seen when those patents and the machine illustrated therein come up for consideration.

Each of the patents to Sedgwick, to which I have already briefly referred, (namely, U. S. patents No. 218,323 and No. 233,033) shows and describes a machine adapted to form the fabric already explained, it being pointed out in both the specifications that the fabric in question has not only the diamond-shaped meshes but also the longitudinal parallel tension wires passing through the body of the fabric. In each of these machines the woof wires from which the meshes are formed are wound on spools supported by suitable
179*b* carriers, the frame of each carrier being supported only at its base, instead of at both ends, as in the Whitehead and Nesmith machines. Each of the spool-carriers of either of these Sedgwick machines has a base which, at both edges, extends under the inner edges of parallel guides, in which it is free to slide; this construction being in effect a dove-tail or T-shaped tongue and gro-ve engagement. In the operation of the machine the spool-carriers are shifted in substantially rectangular paths, each carrier being shifted first from right to left and then from left to right, its motion in each case being about a given center, and the result of all the movements being precisely the same as that of the shifting and twisting movements in any one of the machines above described and explained. The wires from the spool-carriers pass through notches in the margins of rotating twisters substantially like those of the Nesmith machine, these twisters being illustrated in Fig. 8 of patent 218,323 and in Fig. 4 of patent 233,033. The notches in these twisting wheels

open into a common slot in the supporting frame, so that any wire from the shiftable spool-carriers may be shifted from one twisting wheel to the one adjacent to it on either side. In each of the machines shifters substantially like the shifter of the Nesmith machine are so placed and so operated as to shift the woof wires, in the intervals between the rotation of the twisters, to and fro between the adjacent wheels, the shifter of the machine of patent 218,323 being shown in figure 7 of that patent, and the shifter of the machine of patent 233,033 being shown in Fig. 4 thereof. All the twisting wheels or spindles, as they may be called, are formed with central openings for the passage of the parallel warp or tension wires; and the result of the operation of the entire machine is the formation of the desired fabric, with its diamond-shaped meshes and its longitudinal tension wires passing through the intersections of the mesh wires, the whole being performed without any possible entanglement of the shifting wires, because of the similar movements of the spool-carriers and of the wires themselves at the points where they pass through the notches in the rotating twisters.

Each of these Sedgwick machines has evidently a series of centrally perforated rotating spindles and a series of rotatable and shiftable spool-carriers having movements corresponding exactly to those of the rotating spindles. The longitudinal tension wires pass from stationary spools through the central perforations in the twisters; and the woof or mesh wires pass from the spools of the shiftable spool-carriers through notches in the rotating twisters, so that in each twisting operation each woof wire lies at one side of the
180 center of the twisting wheel and is wrapped about the warp wire passing through the wheel. In each of the Sedgwick machines, as in all the other machines thus far described, as well as in all the machines of the patents in suit, only the alternate twisting wheels are actually engaged in twisting the woof wires, at each period of rotation; and with the exception of the outermost twisting wheel or wheels, each of the active wheels operates on two woof wires at the same time, the two wires being on opposite sides of the center of the twisting wheel, and equidistant therefrom. This is the law of all these machines from the Nesmith machine down to the latest of the machines shown in the patents in suit. In view of the position which has been taken on behalf of the complainants in relation to the Kitselman machine, it may be noted here that in each of the Sedgwick machines, as well as in the Nesmith machine, the supports of the warp wires and the woof wires, adjacent to the point of intertwisting, are all in the same plane. In all three of these machines, the longitudinal or warp wires and the woof wires lying on opposite sides of the respective warp wires have their ultimate support, prior to the twist, at the front face of the rotating twisting wheel, so that all the supports are evidently in the same plane.

From the foregoing examination of patents of earlier date than the Davisson patent, which is the earliest of the four patents in suit herein, it appears that when Davisson entered the field, the fabric which he proposed to make was old, not only as to the diamond

meshes of its body portion, but as to the longitudinal tension wires, at its margins or between its margins; that machines for making the fabric in the two forms thus described had been frequently shown and described in prior patents; that a well-known feature of such machines was a series of split or divided twisting wheels, each carrying or moving in unison with a spool-carrier with its spool of woof wire; that in all the machines embodying such divided twisting wheels, means were provided for shifting such divided wheels to and fro for the purpose of combining them differently in order to effect the crossing and twisting of the wires; means being also provided for rotating the complete twisting wheels made up through the registration of such partial wheels; that it was further common and well known in machines for making the fabric in question, to provide a series of non-shiftable centers perforated for the passage of the warp wires and to combine with them shiftable spool-carriers adapted to be moved to and fro from one fixed center to another, suitable shifting mechanism being provided in each case; that in some cases the spool-carriers were supported at both ends and
181 in others at one end only, by means of a base engaging suitable guides; that in one of the machines described in the prior art (namely, in the British patent No. 2516 of 1876), the shifting parts and the non-shiftable center were described as a central section and two side segments of the twisting wheels; that different forms of shifting devices for the transferable twisting sections of the machines had been fully shown and described, one very old form being parallel bars having in their inner edges segmental notches fitting the parts of divided circular twisters; and that of the four descriptions of machines adapted to make the diamond-mesh fabric with warp or tension wires (namely, those found in the patents of Nesmith, the two patents of Sedgwick and the British patent of 1876, No. 2516), that of the Nesmith patent and of the British patent are widely different from each other and from that found in either of the Sedgwick, though the machines described in the four patents have the same purpose and effect the same function in the same general way.

After this general review of the state of the art prior to the Davisson patent, I will take up and discuss in their order the four patents in suit, comparing each of them with the defendants' machine and also comparing each of the machines shown in the patents of Kitselman, Connor and Pope with the patent or patents in suit preceding it in date, since it is alleged on the part of complainants that the invention of the Davisson patent is to be found in the machines of Kitselman, Connor and Pope, and that the invention of the Kitselman patent is to be found in the Connor and Pope machines. I may also, in discussing the patents in suit later in date than the Davisson patent, refer to certain other patents in the prior art relevant to those patents respectively. In my discussion of the patents in suit, I shall make my description of the different machines shown and described therein as brief as possible, confining it in the main to the operative elements included in the combinations set forth in the claims as to which infringement is alleged.

The Davisson patent No. 289,507 shows and describes a machine of the stationary or loom type, in which, as in the Whitehead machine of the British patent of 1854 and the two Sedgwick machines, the fabric is formed in a vertical plane, the forward movement of the fabric being upward from the twisting mechanism to a suitable drum or roll. The machine comprises a suitable frame, a series of vertically sliding bearings mounted in the frame, a corresponding series of rotatable spindles mounted in said sliding bearings and adapted to rotate therein as well as to slide vertically therewith, cross-heads rigidly mounted at the upper ends of the
182 spindles and lying in the same vertical plane, wire spools having hubs perforated and adapted to be mounted on said cross-heards, each of which projects laterally in both directions from its spindle, pinions mounted on the spindles and engaging a rack for their rotation, means for effecting the vertical reciprocation of the spindles and means for transferring the wire spools from cross-head to cross-head, when the latter are brought into the same straight line. As will be seen from an examination of the drawings of the patent, each of the cross-heads is at right angles to its spindle and is at the upper end thereof, so as to form therewith a T. The parts are so adjusted that as the spindles rotate all the cross-heads, which rotate with the spindles, come into the same vertical plane at the end of each half rotation of the spindles; and during each such rotation the spindles or rather their cross-heads, are alternately operative and inoperative, in the same that the alternate cross-heads are provided with spools, while the intermediate cross-heads are empty. The function of this machine being precisely the same as that of the Nesmith machine or either of the Sedgwick machines above described, it is evidently essential to transfer the spools back and forth between the adjacent spindles; and this can evidently only be effected when the cross-heads are not only in the same vertical plane, but when they are in line with each other. The purpose of giving the spindles the longitudinal or vertical reciprocation already referred to is, first, to bring the cross-heads into the same straight line, in order to permit the transfer of each spool from one cross-head to the adjacent cross-head, and second to withdraw the empty cross-heads from the line of those carrying the spools, in order to leave sufficient space for the rotation of the spool-carrying spindles. When, in the operation of the machine, the transfer of the spool is desired, the empty cross-heads with their spindles, which have been dropped to their lowest limit of motion, are raised until all the cross-heads of the machines are in the same straight line. Suitable shippers or shifters then move the spools with their hubs laterally, in opposite directions, so that each spool with its hub passes from its supporting cross-head to the adjacent end of the empty cross-head next it. The cross-heads thus emptied or freed from the spools are depressed by the operation of the reciprocating mechanism, and the spool-carrying spindles, as well as those having the empty cross-heads are rotated. This operation is continually repeated in the use of the machine. The spindles of the machine are described as hollow; and the patent shows and

describes longitudinal, marginal wires passing from fixed spools upward through the two outermost spindles. The operation of the entire Davisson machine is in substance the same and pro-
183 duces the same result as that of the Nesmith machine or either of the Sedgwick machines above described; and while the parts of the Davisson machine are different in form and specific operation from those of either of the other machines referred to, they correspond, each to each, in function and general operation to the parts of the Nesmith machine. The spindles of the Davisson machine correspond exactly in function and in their rotary movement to the sync-roniously operated front and rear twisting gears of the Nesmith machine, each of the front gears of the Nesmith machine, with the corresponding gear at the rear of the machine and the gearing for connecting them positively, being a spindle, as completely and evidently, in a mechanical sense, as any one of the spindles of the Davisson machine. The spindles of the Davisson machine support and rotate the spool-carriers and spools in pairs, in the same way and for the same purpose that the gears of the Nesmith machine support and rotate the corresponding spool-carriers and spools. The shippers or shifters of the Davisson machine move the spool-carriers laterally from spindle to spindle in substantially the same way and for precisely the same purpose that the shifters of the Nesmith machine actuate its spool-carriers in moving them to and fro between the sets of gears. The longitudinal tension wires pass through the axially bored spindles of the Davisson machine, precisely as they pass through the axially bored front and rear gears of the Nesmith machine. The rotation of the spindles of the Davisson machine effects the twisting of the wires and the shifting of the spool-carriers effects the rearrangement of the woof wire in pairs; and the same movements of parts effect the same purposes in the Nesmith machine. It is evident that the Davisson machine discloses no new principle of operation, and that the novel features of construction in the Davisson machine, so far as the same are material, are such as pertain to the means adopted by Davisson for connecting his spool-carriers with the rotating centers or spindles and for shifting the spool-carriers from one rotating spindle or center to another. Davisson substituted for the long spool-carying frames of the Nesmith machine, the perforated hub on which his spools are mounted. He provided his rotating spindles with cross-heads attached to their ends and adapted to receive the perforated spool hubs, this construction being substituted for the support which in the Nesmith machine engaged each spool-carrier frame at both its ends. He substituted for the shifters or separators of the Nesmith machine a pair of ordinary shippers adapted to move the spools and their hubs laterally on and off the cross-heads of the spindles; and he provided
184 means for bringing the cross-heads into line, in order to prepare for such transferance. In addition to this, and as a feature of construction not found in any form in the Nesmith machine, he provided for the longitudinal reciprocation of the spindles, in order to move the empty cross-heads out of line with those carrying

the spools, in each period of rotation of the machine, in order to make room for the rotation of the spools.

The claims of the Davisson patent to which my attention has been called in the present question are those numbered 2 and 3, which are as follows:

2. In a machine for making wire fabric, a series of spindles arranged in a line and mounted in bearings on a suitable supporting frame, and having on each spindle a cross-head carrying reels for wire on opposite sides of the axis of said spindle, substantially as specified.

3. In a machine for making wire fabric, two or more hollow spindles adapted to admit the passage through their axes of wire forming the edges of the fabric, and having on each spindle a cross-head carrying reels for wire on opposite sides of the axis of said spindle, substantially as specified.

These two claims are substantially the same, the difference in the description of the spindles in the two claims being of no consequence, since the spindles are in fact hollow and since, also, in view of the prior art it could involve no invention to make the spindles hollow rather than solid. It is evident that in view of the prior art, the combination with a suitable frame of a series of hollow spindles mounted in suitable bearings in the frame was not new, in a machine of this class, at the time of the Davisson invention, nor was it new for the edge wires of the fabric made by such machine to pass through such hollow spindles. The novelty of each of these claims must therefore be found in the combination with the spindles and the frame of the cross-heads on the frame and the reels of wire on the cross-heads. Considering these features of the combination of each of the claims, it is evident that the terms in which they are stated cannot be constructed to cover any and every device effecting the purpose which these parts are to have, in the structure contemplated in the claims. If any and every rotating part adapted to receive and support a spool-carrier or spool, in such a way that it may be transferred from one rotating part to another, is to be called a spindle and a cross-head thereon, within the meaning of these claims, then the rotating gears of the Nesmith machine supporting as they do the spool-carriers, must each be called a spindle and cross-head. In other words, if either of these claims be broadly construed, or so as to include anything more than the mechanism shown and described in the patent, or the substance of what is so shown and described, then the claim is anticipated and is therefor void.

It will be apparent furthermore from an examination of either of the claims, that it is for an incomplete combination, so far as the purposes of the machine in question are concerned. The mere combination of a suitable frame, a series of spindles mounted in the frame, cross-heads carried by the spindles and wire reels carried on the cross-heads is not sufficient to differentiate the structure from any machine in which it is desirable to support pairs of parallel wires and intertwist the wires of each pair. In construing the claims, therefore, the purpose of the machine must be taken into

account and the other featurers of its construction, including particularly the means for shifting the spools from one cross-head to another must be considered, at least for the purpose of explaining the elements of the combination recited in the claims, if not for the further purpose of including the shifting mechanism in the combination. This is particularly true, in view of the state of the art, which as I have already said, limits the invention of this Davisson machine to the novel means or structure for connecting the spool-carriers with and disconnecting them from the respective rotating spindles of centers. When we thus consider the mechanism necessary to make the combination of either of these claims effective for the purposes of the machine, it appears that the spindles or their bearings must be so constructed and arranged as to permit longitudinal reciprocation of the spindles, and that the cross-heads must be actually carried and rotated by the spindles and must be adapted to receive the spools or their hubs by simple lateral movement from one cross-head to the other—such movement being, of course, longitudinal with reference to the cross-heads. In my judgment then, each of these claims is limited to the combination with a suitable frame, of a series of spindles (hollow or otherwise) mounted in suitable bearings and adapted for longitudinally reciprocal motion, cross-heads carried by and projecting from the spindles and adapted to be brought into line through the reciprocations of the spindles, and spools adapted to be carried by said cross-heads and to be transferred from spindle to spindle by sliding movement on the cross-head. Such a claim is a complete expression of the improvement of change of structure made by Davisson as compared with the prior art. It does not cover any material novelty of function or operation, for the Davisson patent discloses no such novelty; but it does cover the peculiarities of structure, by the use of which Davisson effected a novel engagement and disengagement of the rotating spindles or centers and the transferable spool or spool-carriers.

186 Referring now to the defendants' machine, I may say that wholly aside from the differences of structure due to the fact that defendants' machine is a light, vertical frame machine adapted for operation in the field, while the Davisson machine is a stationary machine or loom, the operating elements corresponding to each other in the two machines are widely different, both in appearance and in actual structure. The defendants' machine, briefly stated, comprises a vertical bar, a series of horizontal tubes set rigidly in the vertical bar and forming therewith, in effect, the frame of the machine, a series of intermeshing gears mounted and rotating on said horizontal tubes, in close proximity to the vertical bar of the frame, and a series of spool-carriers each adapted to be carried by any one of the rotating gears, the peculiar construction of the gears and of the spool-carrier bases that engage the gears being such that whenever the axis of any one of the spool-carriers is directly between the axes of two adjacent gears, the spool-carrier base is in engagement with both the gears, in precisely the same sense and to precisely the same extent, so that if the two gears be rotated in a

given way the spool-carrier will be moved with one of the two gears, in its rotation, whereas if the two adjacent be rotated in the opposite way, the spool-carrier will move with the other of the two gears in its rotation. The machine has no switches or shippers or shifters, corresponding to the shippers of the Davisson patent or the corresponding elements of any of the prior patents, or of any of the other patents in suit, each of which, as I shall show, comprises as one element of the machine which it illustrates, some element outside the rotating gears or spindles and the shiftable spool-carriers, the purpose and function of such outside element being to effect the transfer of the spool-carriers from one rotating part to another at the proper moment in the operation of the machine. The spool-carriers and the means by which the shift from one rotating part to another in the defendants' machine are therefore not only different from any of the devices for that purpose in the machines of the patents in suit, in the same sense in which those devices in the different patents in suit differ from each other, but the defendants' machine is the only one in all the patents thus far considered, in which any outside shifter is dispensed with and the spool-carriers are disengaged from one rotating center and engaged with one adjacent thereto, by the mere change of direction of rotations of the centers and through the opration of parts belonging exclusively to the rotating gears and the spool-carrier bases.

This operation of the spool-carriers and rotating gears of defendants' machine is apparent from an examination of the machine
187 itself and the rotation of the gears which may be readily effected by turning the crank of the machine. It will be found that in this rotation of the gear, any two contiguous gears necessarily rotate in opposite directions; and that either of the gears, in its rotation may carry with it two of the spool-carriers supporting the spools for the woof wire of the fabric to be formed by the machine, it being understood that in the use of this machine, the warp wires are stretched in horizontal parallel lines from one post to another, in the field, the wires being passed through the horizontal stationary tubes of the frame and the machine being moved step by step along the warp wires as the fence fabric is made. Furthermore, while it is true that any one of the rotating gears of the machine is adapted to carry two wire spools or spool-carriers, only the alternate gears are in fact provided with spool-carriers during each period of rotation of the gears of the machine, the construction and operation, in this respect being the same as in the Nesmith machine or any other machine adapted to produce the particular fabric in question. It will also be found that in the rotation of the gears of the machine, each spool-carrier, at the end of every half rotation of the gears, will necessarily reach a point midway between two adjacent gears, the shank or axis of the spool-carrier being in line with the centers of the two gears, and when each spool-carrier is in this relation to two adjacent gears, it will be evident from examination and operation of the parts, that the spool-carrier base is in equal engagement with both the gears. Under these circumstances, it will go with either one of the two gears, according to the direction of rotation; and as

all the spool-carriers come into this relation with the corresponding gears at the same time (the spindles being all in the same vertical plane with the axes of the gears) the reversal of the direction of rotation of all the gears will shift every spool-carrier from the gear with which it has been moving to the next succeeding gear, with which the spool-carrier base is at the instant in engagement.

While the operation thus described and the structure of the gears and spool-carriers may be observed by examining and operating the defendants' machine, it is somewhat more apparent from an examination of a partial machine or model to which I shall refer, this model having been prepared for the purpose of exhibiting more clearly the transfer of the spool-carriers from gear to gear. This model comprises a frame, three of the stationary horizontal tubes rigidly set in the frame and having rotating gears mounted upon them two spool-carriers adapted to operate with the rotating gears, and a crank and pinion for rotating the intermeshing gears.

188 The horizontal stationary tubes, the rotating gears and their parts, and the spool-carriers and their parts are exactly the same in size and structure as the corresponding parts of the complete machine of the defendants. The gears and the plates rigidly fastened thereto have, however, been perforated and the parts have been mounted on a vertical frame bar much narrower than the frame of the working machine, the purpose of these changes being to show the construction and operation of the working parts of the machine.

It will be seen from examination of the model that each of the three successively intermeshing gears is mounted on the corresponding stationary tube and turns freely thereon, the rotation of one gear being thus transmitted to all the others. Each of the gears has on its front face a plate rigidly fastened to it, the plate and gear being, however, separated from each other by a space of about one-half inch, by means of lugs formed on the front face of the gear and furnishing the direct supports of the plate, and the plate and gear being held together by suitable rivets. Each of the gears is formed with two diametrically opposite cyclindrical lugs formed on its front face and extending forward about half way across the space between the plate and the gear; and each of the plates is formed with two spring-actuated pins projecting through it from the front and extending about one-half way across the space between the plate and the gear. Each of the spool-carriers comprises a frame adapted to receive a spool and having an axial shank outside the frame, the shank being terminated by a transverse base plate of such thickness as to enter loosely the space between any one of the gears and the plate fastened thereto. It will be understood that the *the* position of the spool-carriers, in use is horizontal and that the shank is outside the frame of each carrier. The base plate of each of the carriers is approximately square and the shank is central with reference to the base plate. Each or the base plates has in its rear face (that is to say, in the face next the gear, when the base plate is inserted in the space in front of the gear) two approximately parallel curved grooves of uniform depth and extending from edge to edge of the plate; and

each base plate has in its front face two partial grooves oppositely placed and approximately at rights angles to the grooves in the rear face, each of said partial grooves being extended inward from the corresponding edge of the plate, and being open at its outer end and abruptly shouldered at its inner end. The parts thus described are all so formed that when one of the spool-carriers is midway between two adjacent gears, the axis of the carrier being in line with the axes of the two gears, the two contiguous spring-actuated pins of the two gears lie in the inner end of the partial grooves in the front faces
189 of the spool-carrier base, and the two contiguous pins or lugs on the front faces of the two gears are in the complete slots in the rear face of the spool-carrier base. If now the gears be turned in either direction (the two moving oppositely of course), the spring pin of one of the gears will strike the shoulder at the inner end of the partial groove in the carrier base and thus draw the base with it in its rotation, and at the same time, the movement of the carrier base and that of the spring pin of the other gear will release the second spring pin from the partial gro-ve in which it lies, the movement of the pin being such as to carry it along the groove from its closed inner end to its open outer end. At the same time, the cast pin or lug on the gear which takes the carrier with it, will bear against the wall of the slot in the rear face of the carrier base, in which it lies, and will furnish a second point of support for the carrier base, while the corresponding lug on the other gear will move along the gro-ve in the rear face of the carrier base in which it lies, and will thus pass out at the end of the groove. This description is equally true, whichever way the gears be rotated, the carrier base being taken up by and carried with the other gear if the rotation is in one direction, and being carried with the other gear if the rotation is in the opposite direction. Furthermore, when one of the carriers has begun its rotation with one of the gears, it may continue to rotate with that gear, and will not be taken up by an adjacent gear until the direction of rotation is reversed. Each of the base plates of the spool-carriers has on its front face an inclined path leading inward from the edge of the plate to the abrupt inner or closed end of each partial groove of the front of the plate, and as the spool-carrier rotates with one of the gears, the spring-actuated pins of the adjoining gears, during each revolution pass successively along the exposed inclined face, drop into the partial groove at its inner end and pass out at its outer open end. It will be seen therefore that no one of the gears offers any obstacle to the rotation of a spool-carrier or two spool-carriers with the adjacent gear; and that whenever, in the rotation of two adjacent gears, a spool-carrier is exactly between them, it belongs to one gear in the same sense as to the other and will go with one as freely and as readily as with the other, without the use of any means whatever aside from those pertaining to the gears and carriers themselves.

Adjourned until tomorrow morning, October 5, 1898, at 10 o'clock, a. m., at the same place.

190 CHICAGO, *October* 5, 1898—10 o'clock a. m.

Parties met pursuant to adjournment; present as before.

Mr. Wiles, continuing his deposition, said:

From this examination of the structure of defendants' machine, and from a comparison of that machine with the one shown in the Davisson patent in suit, it will be seen that the two machines are radically different, except in so far as they both embody the broad principle of construction and operation of the Nesmith machine. Each of them, like the Nesmith machine, comprises a series of rotating centers, some or all of them perforated for the passage of longitudinal warp wires and a series of spool-carriers transferably or interchangeably mounted on the rotatable centers and carrying the woof-wire spools. The defendants' machine, however, embodies a wider departure from the Nesmith structure, in one important particular, than does the Davisson machine; since the Davisson machine includes shipping or shifting mechanism in addition to the rotating centers and shiftable spool-carriers, this mechanism being a substitute for the shifting mechanism of the Nesmith machine, whereas, as has been pointed out, the defendants' machine has no such additional or external shifting mechanism for effecting the transfer of the spool-carriers from one rotating center to another. Comparing the defendants' machine somewhat minutely with the Davisson machine, so far as the material operative parts are concerned, it is apparent that the defendants' machine has no spindles, corresponding in purpose or function to the spindles of the Davisson machine. In the Davisson machine, the spindles not only rotate but have longitudinally reciprocal movement, both these motions being necessary to the operation of the machine as it is constructed; since in that machine, the rotation of the spools is effected by the rotation of the spindles, and the transfer of the spools from the cross-heads of one spindle to that of another is effected only when the cross-heads are all brought into line, by means of the longitudinal reciprocation of the spindles. In other words, the spindles of the Davisson machine are parts having material and necessary operative movements; and it is apparent that if the spindles of that machine be deprived of these movements and made absolutely stationary, as by fastening them rigidly to the frame of the machine, the entire machine would need reconstruction and would in fact cease to be the Davisson machine of the patent. On the other hand, the horizontal tubes of defendants' machine, set rigidly at their rear ends in the vertical frame bar, are as I have said, practically parts of the frame.

191 They have no motion whatever and no function, except that of wire guides adapted and intended to support the longitudinal warp wires of the fabric. For this purpose, they are nothing more than forward extensions of the walls of the openings in the frame bar through which the warp wires pass; and their use or omission, as well as their length is evidently a mere matter of mechanical choice. It is undoubtedly desirable to support the warp wires at or near the points at which the woof wires are wrapped about them; and in this machine, these supporting tubes have been

given such length as to afford each warp wire a point of support about two inches in rear of the point at which the woof wires are wrapped about them. The length of the tubes is therefore, merely a matter of choice to be determined by mechanical experiment; and the function of each of these tubes, as I have said, is in substance the same as that of openings in the frame for the passage and support of the warp wires. I do not overlook the fact that each of these tubes forms the bearing on which the corresponding gear of the machine is rotatably mounted; but in this respect again, the function of the tubes is simply that of parts of the frame, since it is evident that the gears might be provided with rearwardly extending hubs or spindles journaled in the frame bar, when they would rotate in the same way and for precisely the same purpose as in the machine having the stationary tubes supporting the gears. If thus mounted, the centrally perforated gears would correspond closely to the perforated gears of the Nesmith machine; and they would have both the general functions of those gears, namely the function of supporting and permitting the passage of the warp wires and of supporting and rotating the spool-carriers for the woof wires.

Furthermore, the spool-carriers of the defendants' machine are essentially different from those of the Davisson machine, not only in such differences of shape or mechanical alteration as would make it impossible to transfer the spool-carriers from one machine to the other, but to such an extent as to involve a difference of principle of their operation, except as to the broad similarity which they bear to each other, as well as to the Nesmith machine, or to any other machine having a series of rotating centers and a series of spool-carriers transferably mounted on and moving with the rotating centers. The spool-carriers of the Davisson machine are transferred from cross-head to cross-head of the adjacent spindles, by a sliding movement of the spool-carriers and spools when the rota-ble cross-heads are at rest—the operation in this respect being similar to that of the Nesmith machines in which the spool-carriers are
192 transferred by a lateral sliding movement, when the rotating centers are at rest. In the defendants' machine, on the contrary, the transfer of the spool-carriers can only be effected by the rotation of the gears. If the rotation of the gears be suspended, when the shanks of the spool-carriers are in the plan-s of the axes of the gears, each spool-carrier base, as has been pointed out, is equally in engagement with the two gears lying on opposite sides of it. It has been brought into that relation, through the rotation of the gears; and nothing can be done to effect its transfer, or decide which of the gears it will follow, so long as the gears remain stationary. The beginning of the rotation of the gears effects the transfer, since the direction of rotation fixes the direction in which the spool-carrier shall move, by deciding which of the gears it shall follow and which one it shall leave. In the transfer of the spool-carriers of the Davisson machine, each of them must have a bodily movement at least equal to its width (that is, to the length of its axis), in passing from one cross-head to another. In the transfer, or change of movement of the spool-carriers of the defendants' machine, the

spool-carriers cannot be said to have any appreciable movement, since the transfer of each spool-carrier is completed at the instant the gears begin to rotate—that is as soon as the pressure of the spring-actuated pins of one set of gears is brought to bear against the shoulders at the inner ends of the partial slot in the spool-carrier bases and the pressing contact of the spring pins of the intermediate gears is suspended. It will be seen, therefore, that the principle of transfer of the spool-carriers of defendants' machine is wholly different from that of the transfer of the spool-carriers of the Davisson machine.

Not only is the transfer of the spool-carriers of the two machines under comparison essentially different in all its mechanical features; but as I have pointed out above, the Davisson machine has shifters or shippers for effecting the transfer, while the defendants' machine has no such means whatever, the transfer being affected through the structure of the rotating gears and spool-carrier bases themselves. The shippers of the Davisson machine, or some equivalent device in addition to the cross-heads, spools and spool hubs, are essential to the transfer of the spools; and their omission from the Davisson machine would necessitate a reconstruction of its plan. The defendants' machine has no such shipping devices, nor has it any necessity for any such devices.

I have already discussed the claims of the Davisson patent and the construction which, in my judgment, should be given to them in view of the prior art and of the specification and drawings
193 of the patent itself; and having now examined the defendants' machine and compared its essential parts with those of the Davisson machine, I need only say in conclusion that the defendants' machine does not embody the invention set forth in either claim 2 or claim 3 of the Davisson patent. The position of the Davisson patent in the art is not such as to warrant any expansion or broad construction of its claims; and as the defendants' machine differs from the Davisson machine in every particular of construction and operation, except those that were old and well known long before the Davisson invention, it is impossible to properly give the Davisson claims any such scope as will include the defendants' machine.

The second patent in suit, No. 356,322, issued January 18, 1887, to Alva L. Kitselman, is for improvements in wire-fabric machines, and shows and describes a machine adapted for use in the field, as distinguished from machines of the loom type like those of Davisson and Nesmith. There is, however, no claim of the patent relating to a field machine, as distinguished from a loom; and the fact that the Kitselman machine is a field machine is therefore wholly immaterial, and any comment on the fact is entirely irrelevant to this suit. Furthermore, Kitselman was not the originator of the idea of a field machine for building wire fence in the field. A well-known form of fencing made long before Kitselman's invention was that in which longitudinal pairs of wires were intertwisted, with vertical slats or pickets inserted between the twists, at suitable intervals; and Kitselman states in his specifications that his machine is adapted to

make such fencing, the structure of the fence itself being illustrated in Fig. 19 of the drawings of the Kitselman patent. This fencing was made on stationary machines, or looms, such for instance, as that shown in U. S. patent No. 312,063, issued to George C. Adams, February 10, 1885, for improvements in fence-making machines; and machines adapted to make such fencing in the field are shown in various patents prior to the Kitselman patent, as for instance in U. S. patent No. 298,368, issued May 13, 1884, to John M. Fultz, for improvements in upright fire-fence-making machines, U. S. patent No. 309,724, issued December 23, 1884, to Middaugh and Wilcox for portable fence machine, and U. S. patent No. 347,064, issued August 10, 1886, to William H. Reppeto, for improvements in fire-fence machines. In the use of all these portable machines, or field machines, the longitudinal wires were stretched between suitable supports in the field and passed through tubes or spindles in the frame of each machine, the machine in every case being moved along the
194 wires as the fence was formed. The step of change or improvement from the stationary or loom machine to the movable field machine having been taken in the manufacture of one form of wire fencing, there was evidently no invention in the mere change from the loom to the field machine in the manufacture of the other well-known form of wire fencing. Furthermore, as may be seen by examining any one of the three patents just referred to, the field machines for making wire and slat fencing had the same characteristics adapting them to use in the field which are found in the Kitselman machine or any of these other field machines for making diamond-mesh fencing. Each of them had a vertical frame supporting its working parts, the frame being provided with means for moving it readily along the line of fence and being adapted to permit the passage through it of the longitudinal wires of the fence. The operating parts were adapted for the manufacture of the particular fencing which the machines were intended to make, and they were not capable of making the diamond-mesh fencing which is manufactured by the defendants' machine herein or by the machines shown in the patents in suit. So far as the feature of adaptability to use in the field is concerned, they fully anticipate any possible invention in the Kitselman machine.

As shown and described in the drawings of the Kitselman patent and as exemplified in the exhibit in evidence herein, the Kitselman machine has a frame made up of three vertical rigidly connected members forming respectively the front and rear walls of the frame and an intermediate wall somewhat nearer to the rear member than to the front. The front and intermediate members of the frame may each be made of two parallel bars, or may be each a single bar having a vertically slotted center; and the rear member may be either open or solid, as may be desired. The frame thus constructed is clearly illustrated in Figs. 4 and 1 of the drawings of the Kitselman patent, the connection of the members of the frame being best illustrated in Fig. 1. A series of rotatable horizontal hollow spindles are mounted in suitable bearings in the rear and intermediate members of the frame and are provided with gears in successive engage-

ment with each other, each gear being rigidly fastened on its spindle, so that the rotation of the gear must rotate the spindle. One of the gears of the series is provided with a bevel gear rigidly fastened to it and this gear is in engagement with a bevelled pinion mounted on a crank shaft, the crank shaft in turn being provided with a suitable crank and handle for its rotation and for the consequent rotation of all the gears of the series.

Each of the rotatable spindles is formed with a flat forward
195 extension in the form of a skeleton frame made up of two transverse members and two longitudinal members, the whole being formed in a single piece and being of such length that the transverse members of each flat extension lie respectively, one just in rear of the front member of the frame and the other just in front of the intermediate member of the frame. These forward extensions, which are supported by and rotate with the shafts, have their respective axes coincident with the axes of the hollow shafts; and the two transverse members of each of the forward extensions are centrally bored, in line with the bore of the corresponding shaft, so that warp wires may pass in horizontal lines through the rotatable shafts and their forward extensions. The machine is provided with a series of spool-carriers, each of which may carry a woof-wire spool; and each of these spool-carriers is a single-piece casting of the same length as the forward extension on each of the shafts. Each such casting consists of a flat longitudinal member adapted to lie side by side with the flat longitudinal bars of any one of the forward extensions of the rotatable spindles, and two segmental heads or ends each adapted to lie with its flat side against the corresponding transverse member of any one of the forward extensions of the rotating spindle. The segmental heads of the spool-carrier castings are of such dimensions that when two of the castings are placed on opposite sides of any one of the forward extensions of the rotatable spindles, the two segments and the intermediate transverse member of the spindle extension between them, form a complete circle at either end of the compound three-part structure made up of the spindle extension and the two spool-carrier castings. Each of the spool-carrier castings is adapted to receive and support a woof wire; and it is evident that if two of the castings, with their spools, be held at any time in fixed connection with one of the spindle extensions between them, the rotation of the spindle and its extension must rotate the spool-carrier castings and their spools. The segments at the ends of each spool-carrier casting are similar; but only one of them is perforated for the passage of the woof wire from the spool; and this segment is in use, made the front end of the spool-carrier. It is clear that the rotation of any given spindle and its extension, with two spool-carriers lying on opposite sides of the extension and in connection therewith, must intertwist the woof wires from the two spools, at a point in front of the front end of the spindle extension; and it is further evident that if the machine is to make the diamond-mesh fabric, means must be provided for shifting the spool-carriers to and fro between the adjacent spindle extensions or rotating centers which effect the rotation of the spool-carriers.

196 For the purpose of holding the spool-carrier frames temporarily in registration or engagement with the rotating spindle extensions, and for the further purpose of shifting the spool-carriers, in order to remate the woof wires, the machine is provided with two vertically reciprocating guides or shifters, one on either side of the vertical plane of the axes of the spindles and their extensions. Each of these guides is made up of two rigidly connected vertical bars, one just in rear of the front member of the frame, and the other just in front of the intermediate member of the frame, each of the bars being provided with a series of castings, extending inward toward the central plane of the machine and each terminating at its inner and in a re-entrant segmental curve adapted to conform to the segmental margin of any one of the heads of the carrier frames or castings. These castings lie in the planes of the segmental heads of the carrier frame; and when the two guides or shifters on opposite sides of the machine are so adjusted that their castings are directly opposite each other, the curved edges of any two opposite castings are arcs of a common circle and will practically enclose and hold in working relation, as a complete circle, the two segmental carrier frame heads lying between them, together with their interposed transverse member of the spindle extension. The consequence is, that the carrier frames may be arranged in pairs on the alternate spindle extensions of the machine and held in place by the curved edges of the castings on the guides or shifters, the two curved edges of any opposite pair of such castings forming a circular guide adapted to hold the three parts of the corresponding circle of the twister in proper relation to each other while they are rotated; and when the parts are thus arranged, the rotation of the spindle must evidently effect the rotation of the three-part twisters with their spools and thereby intertwist the wires from the two spools carried by each spindle extension. Furthermore, the guides on the two opposite sides of the machine are connected by a walking-beam at the upper end of the frame, so that as one of them moves upward, the other must move downward to an equal extent; and a lever is provided for effecting this opposite reciprocation of the two guides or shifters. Before each such movement of the guides or shifters, the twisters are all rotated into such positions that their flat central members (the forward extensions of the spindles) are in the central vertical plane of the machine, the plane faces of the spool-carrier castings being likewise of course in vertical planes. When the parts are in this relation, the opposite vertical movement of the two guides or shifters must evidently carry the spool-carriers at one side of the center of the machine downward and those at the opposite side
197 upward; and the shifters are given sufficient movement to transfer each spool-carrier from one spindle to the one next above or below it. It will be understood that in the use of this machine, as in that of any of the others under consideration, only the alternate spindles are provided with spools during any given rotation of the parts, the intermediate spindles being empty. By means of the operation of the guides or shifters just described, the spool-carriers, in the intervals between the periods of rotation, are trans-

ferred each time from the full spindles to the empty ones, and this transfer, as in any of the other machines, remates the wires and effects the formation of the diamond mesh.

I have made this description and explanation of the machine as brief as possible and without pointing out the illustration of details of construction in the drawings, for the reason that as the Kitselman machine is exemplified by a full-sized exhibit in evidence herein, that exhibit may serve for purposes of reference, instead of the drawings of the patent. I may say, however, that the structure of the frame is clearly shown in Figs. 1 and 4; that the relation of the guides or shifters and their operation is illustrated in Figs. 5 and 6, the former figure showing also the walking beam and lever for operating the shifters; and that the construction of the spindle and its forward extension and the construction and relation to the spindle of the spool-carrier castings are clearly shown in Fig. 7 of the drawings. I observe on looking at the Figs. 5 and 6 of the drawings, that the oppositely placed guides are not provided with castings having curved inner edges fitting the segmental ends of the carrier frames, though that is the construction which appears in the exhibit machine. The guides or shifters shown in the drawing are flat members with curved recesses in their inner edges, the shape of the recesses being the same as that of the curved inner ends of the castings in the machine.

It is apparent from the foregoing examination of the Kitselman machine that its essential parts, in addition to a suitable supporting frame, are a series of twisters, each of which is a skeleton cylinder made up of three parts, namely a flat central portion provided with means for its rotation, but not capable of shifting motion, and two side portions, each a segment having its flat face in contact with the flat central section, the segmental sections being provided with woof-wire spools. To these twisters must evidently be added the means for holding them in proper relation while they rotate and the means for shifting the segmental side sections of the twisters from one central section to another. The means used in the machine for supporting and shifting the parts of the twisters 198 will be recognized at once as the same shown and described in the British patent of 1854 to Whitehead; and there is evidently no novelty whatever in those elements of the Kitselman machine. Furthermore, in view of the Nesmith and Davisson patents, there is of course no novelty in the general principle of operation of the Kitselman machine—that is, in the combination with the series of rotatable centers or spindles, of spool-carriers adapted to be temporarily mounted in pairs on the alternate spindles and rotated therewith, and then to be shifted to the intermediate spindles, to be rotated with them. Not only is this true, but the arrangement of the spindles and spool-carriers of the Kitselman machine is very closely related to the corresponding arrangement in the Nesmith machine. Any two front and rear pinions of the Nesmith machine, in line with each other, and connected by the gearing of the machine so as to rotate in unison, are as I have said before, the same in effect as a single spindle; and in fact each such

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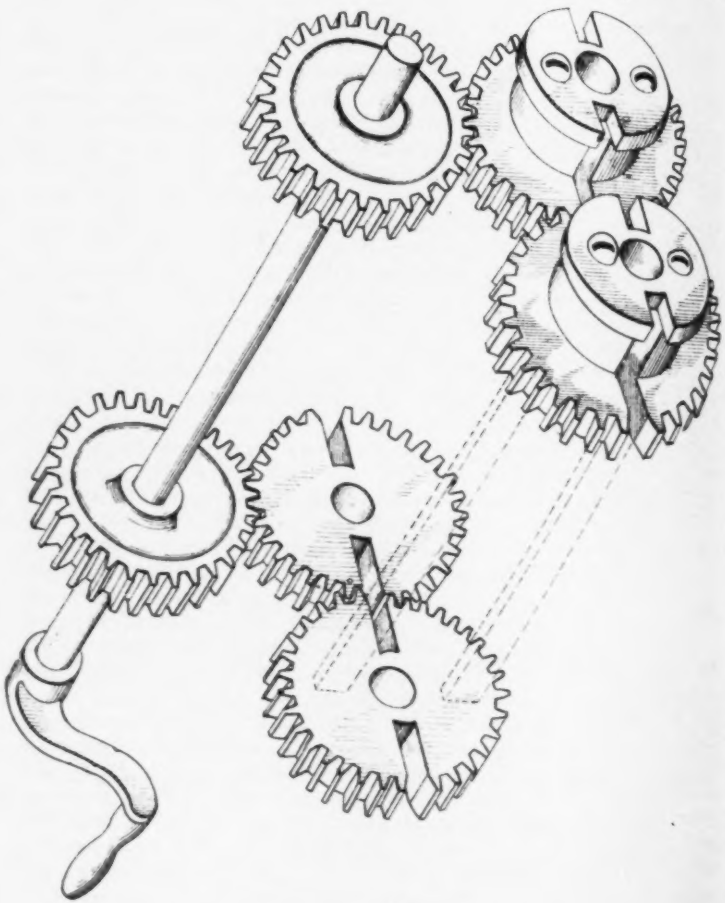
Defendants Exhibit
Illustrative Drawing.
Belle W. Barr
Notary Public.



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vs
Kilselman
} p. 199

pair of gears with its synchronous rotation is the same mechanically as it would be if the two gears were connected by two flat parallel bars like those of each of the forward extensions of the spindles in the Kitselman machine. In order to make my meaning on this point perfectly clear, I produce a drawing illustrating front and

(Here follows diagram marked p. 199.)

rear twister gears of the Nesmith machine connected by such rigid bars; and I repeat that the gears so provided with connecting bars are the evident equivalent of the gears as they appear in the Nesmith machine, not connected by the bars, but effectively connected by gearing insuring their synchronous rotation. In fact, the bridging over by means of suitable gearing, of a gap formed for convenience between the two parts of a shaft lying in the same straight line, is a well-known expedient and a well-known substitute for a continuous shaft.

Assuming then, that the front and rear pairs of gears of the Nesmith machine are the equivalent of the rotating spindles of the Kitselman machine, as they evidently are, the support of the spool-carriers in the Nesmith machine and their transfer from spindle to spindle corresponds closely to the analogous features of operation of the Kitselman machine; the differences being only such as are due to the changed form of the spool-carrier castings and the consequent adoption by Kitselman of the old and well-known transfer mechanism of the machine shown in the Whitehead British patent. Furthermore, the British patent of 1876 to Smith, the specification of which has been quoted in full in an earlier part of this answer, must be taken into account in determining the degree of the Kitselman invention. It will be remembered that the specification of the British patent of 1876 contains this statement: "Or I divide the twisting wheels into three parts; my
201 extra wire (that is, the warp wire) passing through the central division, and the two side segments travel to and fro to form the twist, leaving the central division in position with my supplementary wire therein maintained." Whatever may be said as to the completeness or incompleteness of the disclosure of the structure contemplated in this British patent, my own opinion is that any person familiar with the Whitehead British patent of 1854 and the Nesmith U. S. patent of 1854, might, in the exercise of mechanical skill have carried into effect the invention thus briefly described, the result being necessarily a construction substantially like that of the Kitselman machine, as to the rotating twisters and the shifting mechanism.

The claims of the Kitselman patent, of which infringement is alleged, and to which my attention is particularly called by the present question, are those numbered 1, 2, 9, 10, 11, 15, and 20, which are as follows:

1. In a wire-fabric machine, a series of sectional twisters, each of which comprises a central section for carrying a warp wire, and having rotary movement imparted thereto, and the shifting sections for carrying the weft wire, and receiving rotary motion from the central

section to form the twist, substantially as and for the purpose herein described.

2. In a wire-fabric machine, the combination of a series of sectional twisters geared together for simultaneous rotation, and each comprising a central portion movable only on its axis and side portions capable of a compound movement—that of rotation on their axes—and of a shifting longitudinal movement, substantially as described, for the purpose set forth.

9. In a wire-fabric machine, the series of sectional twisters, comprising the central and side sections, the central section of each twister being geared to the twister adjacent thereto for simultaneous operation, substantially as described, for the purpose set forth.

10. In a wire-fabric machine, the combination of a series of twisters geared directly together for simultaneous operation, and each comprising a central section and the side section, each side section carrying a spool or reel for the wire, substantially as described, for the purpose set forth.

11 In a wire-fabric machine, a series of twisters connected for simultaneous operation, and each consisting of a central section and the side section, in combination with the spools carried by the side sections, the central section of each twister being provided with a longitudinal opening for the passage therethrough of the warp wire, substantially as described.

15. In a wire-fabric machine, the combination of a series of rotary twisters geared directly together for simultaneous operation, each twister having a central section capable of rotary movement only, and two side sections which are capable of a shifting movement
202 independently of the central section in opposite directions simultaneously, whereby the said shifting sections of one twister are adjusted to register with the central sections of twisters on opposite sides of the same, substantially as described, for the purpose set forth.

20. In a wire-fabric machine, a series of sectional twisters, each comprising a central section, the central sections being geared together to be simultaneously rotated on their axes, and the shifting side sections adapted to align with the central sections to be rotated therewith, substantially as described, for the purpose set forth.

Before proceeding to the direct consideration of the scope of these claims, I desire to refer, as briefly as possible, to the file-wrapper and contents of the application for the Kitselman patent in suit, a certified copy of the file-wrapper and contents being placed in my hands for that purpose.

The application, as filed, included the following claims, all of which were erased in the course of the prosecution of the application and in compliance with the requirements of the Patent Office, in view of prior patents cited as references:

"1. In a wire-fabric machine, a series of sectional twisters geared directly together, substantially as described, for the purpose set forth.

2. In a wire-fabric machine, the combination of a series of sectional twisters capable of sliding movement with relation to each

other and geared for simultaneous rotation, substantially as described, for the purpose set forth.

3. In a wire-fabric machine, the series of sectional twisters comprising the central hub section and the two side sections disposed on opposite sides of the central section, the hub section being stationary while the side sections are capable of shifting movement, substantially as described, for the purpose set forth.

4. In a wire-fabric machine, the series of sectional twisters, each of which comprises a longitudinally immovable section and two sections which have langitudinal movement, substantially as described, for the purpose set forth." (The "longitudinal" movement mentioned in this claim is evidently a movement longitudinal with reference to the frame of the machine.)

5. In a wire-fabric machine, the series of sectional twisters, each of which comprises the central portion carrying the warp wires and the shifting side sections which carry the weft wires, substantially as described.

7. In a wire-fabric machine, the combination of a series of sectional twisters, comprising the stationary central portion capable of rotation on its axis only, and the side sections having a longitudinal movement, and means for shifting the said side sections to cause one section of one twister to coincide with the central section of the adjacent twister, substantially as described, for the purpose specified.

203 10. In a wire-fabric machine, the sectional twisters comprising the central portion or section and the side sections disposed on opposite sides of the central section and movable with respect to each other, substantially as described.

12. In a wire-fabric machine, the sectional twisters comprising the central section and the two side sections, in combination with the simultaneously sliding frames movable in opposite directions and carrying the side sections of the twisters, substantially as described, for the purpose set forth.

19. In a wire-fabric machine, the combination of a track, a carrying frame geared to the track, and having the twisting devises and the reels, and pawl and ratchet mechanism for feeding the frame and its devices, substantially as described, for the purpose set forth.

It will be noticed that the claim 19 last quoted related to mechanism distinguishing the machine of the patent as a field machine, the combination set forth in the claim being such as would be applicable to a field machine and not to a loom.

The application was filed in the Patent Office August 13, 1886; and in a Patent Office action or letter dated September 14, 1886, claims 1 and 2 of the patent were rejected on two U. S. patents and one English patent, and claim 19 (the claim relating specifically to a field machine), was rejected on two American, or U. S. patents, No. 298,368, to Fultz, and No. 322,872, to Watson, both of said patents being for machines for making wire and slat fencing in the field.

In a letter filed in the Patent Office September 27, 1886, the appli-

cant erased claims 1 and 2 and substituted therefor the following claims:

1. In a wire-fabric machine, a series of rotary twisters geared directly together for simultaneous rotation and each having two sections which are capable of a sliding movement, substantially as described, for the purpose set forth.

2. In a wire-fabric machine, the combination of a series of rotary twisters geared directly together, substantially as described, for the purpose set forth.

He also, in the same letter, erased claim 19 (the one relating to the field machine), and added the following claims:

"21. In a wire-fabric machine, the combination of a series of rotary twisters geared directly together for simultaneous operation, each twister having a central section capable of rotary movement only, and two side sections which are capable of a shifting movement independently of the central section, in opposite directions simultaneously, and thereby adapt the said shifting sections of one twister to register with the central section of twisters on opposite sides of
204 the same, substantially as described, for the purpose set forth.

22. In a wire-fabric machine, the combination of a series of rotary twisters geared together for simultaneous operation, each twister comprising a central section capable of rotation on its axis only, and the shifting sections arranged on opposite sides of the central section, each side section having segmental heads which impinge upon the central section when the twister is rotated, substantially as described and for purpose set forth.

23. In a wire-fabric machine, the combination of a series of rotary twisters, each of which consists of two shifting sections capable of movement in opposite directions simultaneously and a central section interposed between the shifting sections and impinging upon the latter when they align therewith to rotate the same, substantially as described.

24. In a wire-fabric machine, the combination of a series of rotary twisters, each of which consists of a central section held from endwise movement and capable of rotation on its axis only, and the side sections capable of shifting movement in opposite directions simultaneously, the side sections of one twister being arranged on opposite sides of the central section thereof and impinging upon the latter to be rotated on their axes therewith, the twisters being capable of rotary movement only when the shifting side sections thereof are in line with the central section, substantially as described, for the purpose set forth.

25. In a wire-fabric machine, the combination of a series of rotary twisters, each twister comprising the shifting side sections provided with the segmental heads through which the warp wires are to be passed, and the central section disposed between the side sections and held from shifting movement, the central sections of the series of twisters being geared directly together and impinging upon the side sections when the latter are in line therewith, to ro-

tale the said side sections, substantially as described, for the purpose set forth."

Adjourned until tomorrow morning, October 6, 1898, at 10 o'clock a. m.

CHICAGO, *October* 6, 1898—10 o'clock a. m.

Parties met pursuant to adjournment; present as before.

Mr. Wiles, resuming his deposition, said:

The letter of September 27, 1886, making the foregoing amendments, closed with the following statement: "The references cited do not disclose the series of rotary sectional twisters geared directly together for simultaneous operation, to which our claims are now limited and favorable action is solicited. The specification has been corrected throughout, and it is believed that no further objection thereto will be made."

205 It will be seen that by the erasure of claim 19, the applicant struck out and surrendered any claim whatever to any combination of elements distinguishing his machine from the stationary or loom type, of the prior art and abandoned all claim to any invention due to the fact that his machine was a portable or field machine.

On the 30th of September, 1886, the application was again acted upon by the office, and, in addition to certain objections as to matters of form, this office action included the rejection of claims 1 and 2 (the substitute first and second claims inserted by amendment of September 27th) on the U. S. patent of Nesmith No. 10,743, that being the Nesmith patent to which I have called attention in the course of this deposition. As the two claims in question are very brief, I will quote them again, in view of their rejection on the Nesmith patent as a reference. The two claims were as follows:

"1. In a wire-fabric machine, a series of rotary twisters geared directly together for simultaneous rotation and each having two sections which are capable of a sliding movement, substantially as described, for the purpose set forth.

2. In a wire-fabric machine, the combination of a series of rotary twisters geared directly together, substantially as described, for the purpose set forth."

On the 13th of October, 1886, the applicant filed a letter of amendment whereby he erased said claims 1 and 2, changed the numerals of all the remaining claims (23 in number) and added two new claims as follows:

"24. In a wire-fabric machine, the combination of a series of rotary twisters geared directly together and each having shifting sections for carrying the wire, movable in opposite directions simultaneously, substantially as described, for the purpose set forth.

25. In a wire-fabric machine, the combination of a series of rotary twisters geared directly together and each having two shifting sections which are capable of movement in opposite directions simultaneously and carrying fixed spools upon which the warp wires are wound, substantially as described, for the purpose set forth."

On the 15th of October, 1886, the office again acted on the application and rejected claims 24 and 25 on the Nesmith patent and U. S. patent to Combs No. 310,254.

On October 21st, 1886, the applicant filed in the office a letter requesting a reconsideration as to claims 24 and 25 and giving reasons in support of such request.

On the 29th of October, 1886, the office made another action
206 in the case, rejecting claims 24 and 25 a second time, on the references already cited, and also rejecting claims 1, 2, 3, 5, 6, 7, 8, 10, 11, and 21 on the British patent No. 2516 of 1876, to which I have called attention in the course of this deposition.

On the 11th of November, 1886, the applicant filed a letter of amendment making various changes of form in the claims and also erasing certain claims, the amendment, so far as it related to the erasure of claims being in substance as follows: First the amendment erased claims 1, 2 and 3 (original claims 3, 4 and 5) and inserted a new claim numbered 1 as follows:

"1. In a wire-fabric machine, a series of sectional twisters, each of which comprises central section for carrying a warp wire and having rotary movement imparted thereto, and the shifting sections for carrying the weft wire and receiving rotary motion from the central section to form the twist, substantially as and for the purpose herein described."

Second, the amendment erased claim five (original claim 7) and inserted a new claim numbered 3, as follows:

"3. In a wire-fabric machine, the combination of a series of sectional twisters comprising the central section having rotary movement imparted thereto to rotate the same on its axis only the shifting side sections adapted to align with the central sections to be rotated thereby, and mechanism for shifting the said side sections to cause the side section of one twister to coincide with the central section of the adjacent twister, substantially as described, for the purpose set forth."

Third, the amendment erased claims 24 and 25 and added a new claim numbered 20, as follows:

"20. In a wire-fabric machine, a series of sectional twisters, each comprising a central section, the central sections being geared together to be simultaneously rotated on their axes, and the shifting side sections adapted to align with the central sections to be rotated therewith, substantially as described, for the purpose set forth."

The claims 1, 2 and 3 erased by this amendment (original claims 3, 4 and 5 of the specification) and the claims 24 and 25 also erased (being the claims inserted by amendment of October 13, 1886) are of such importance that I wish to quote them together at this place, although they have already been quoted above and might be found and examined by referring back to the places in which they appear. The five claims thus erased were as follows:

1. (Original claim 3.) In a wire-fabric machine, the series of sectional twisters comprising the central hub section and the
207 two side sections disposed on opposite sides of the central section, the hub section being stationary while the side sections

are capable of shifting movement, substantially as described, for the purpose set forth.

2. (Original claim 4.) In a wire-fabric machine, the series of sectional twisters, each of which comprises a longitudinally immovable section and two sections which have longitudinal movement, substantially as described, for the purpose set forth.

3. (Original claim 5.) In a wire-fabric machine, the series of sectional twisters, each of which comprises the central portion carrying the warp wires and the shifting side sections which carry the weft wires, substantially as described.

24. In a wire-fabric machine, the combination of a series of rotary twisters geared directly together and each having shifting sections for carrying the wire, movable in opposite directions simultaneously, substantially as described, for the purpose set forth.

25. In a wire-fabric machine, the combination of a series of rotary twisters geared directly together and each having two shifting sections which are capable of movement in opposite directions simultaneously and carrying fixed spools upon which the warp wires are wound, substantially as described, for the purpose set forth.

It will be seen that the claims erased in the course of the prosecution of the Kitselman application (and all erased because of rejection by the examiner in view of prior patents) were statements and restatements, in different terms, of the general combination of operative parts making up the twisters of the Kitselman machine. In view of these erasures, it may be said, without question, that Kitselman admitted that in a wire-fabric machine, it was old to employ a series of sectional twisters geared directly together; that it was old to employ in such a machine, a series of sectional twisters capable of sliding movement with relation to each other and geared for simultaneous rotation; that it was old to use in such a machine a series of sectional twisters comprising the central hub section and two side sections disposed on opposite sides of the central section, the hub section being stationary and the side section capable of shifting movement (the central section being "stationary," in the sense of not having shifting movement); that it was old in such a machine to use a series of sectional twisters, each comprising a longitudinally immovable section and two sections having longitudinal movement, (this "longitudinal movement" being evidently longitudinal with reference to the frame of the machine); that it was old to use in such a machine, a series of sectional twisters each comprising a central portion carrying the warp wire and shifting side sections carrying the weft wire; that it was old to use in such a machine, a series of sectional twisters each comprising
208 the stationary central portion capable of rotation on its axis only, and the side sections having a longitudinal movement, and means for shifting the side sections to cause one section of one twister to coincide with the central section of the adjacent twister; that it was old to use in such a machine, the sectional twisters comprising the central portions or sections and side sections disposed on opposite sides of the central sections and movable with respect to each other; that it was old to use in such a machine, sectional

twisters comprising the central section and the side sections, in combination with the simultaneously sliding frames movable in opposite directions and carrying the side sections of the twister; that it was old to use in such a machine, a series of rotary twisters geared directly together and each having shifting sections for carrying the wire, movable in opposite directions simultaneously; and that it was old to use in such a machine a series of rotary twisters geared directly together and each having two shifting sections capable of movement in opposite directions simultaneously and carrying fixed spools upon which the warp wires are wound. Furthermore, by the erasure of claim 19 of his application, Kitselman struck out the only claim assuming any novelty in the machine by reason of its being a field machine, instead of a stationary machine.

In view of these admissions, it seems apparent that the remaining claims in the Kitselman patent, including all the claims to which my attention has been called, must be limited in their scope to the actual combination of essential parts found in the Kitselman machine, and that they cannot be so construed as to cover other combinations, which though effecting the same result, are made up of elements of different construction from those found in the Kitselman machine. It will be seen from an examination of the claims of the patent which are alleged to be infringed that each of them is so drawn as to aptly describe the Kitselman structure. Thus claim 1 is for a series of sectional twisters, each having a central section for the warp wire and two shifting sections for carrying the weft wire; claim 2 is for a series of sectional twisters, geared together for simultaneous rotation, each comprising a central portion and two shiftable side portions; claim 9 is for a series of sectional twisters comprising central and side sections, the central section of each twister being geared to the twister adjacent thereto; claim 10 is for a series of twisters geared directly together for simultaneous operation, each comprising a central section and side sections, each side section carrying a spool or reel for the wire; claim 11 is for a series of twisters connected for simultaneous operation, each consisting of a central section and side sec-
209 tions, in combination with spools carried by the side sections; claim 15 is for a series of rotary twisters geared directly together for simultaneous operation, each twister having a central section and two side sections; and claim 20 is for a series of section twisters, each comprising a central section and shifting side sections. Any one of these claims is a suitable general description of the twisting and shifting sectional twisters of the Kitselman machine; and in view of the erased claims and the admissions involved in making the erasures, the twisters enumerated as elements of these claims must be held to be the three-part twisters of the Kitselman machine, each made up of the three sections forming together the compact and symmetrical whole shown and described in the patent.

Considering these claims, without reference to the disclosures of the file-wrapper and contents, it is evident that each of them is limited by the prior art to the substantial*ly* embodiment of the specific elements shown and described in the Kitselman patent—

that is, to the specific construction of the twisters of the Kitselman machine. If it be attempted to give the claims any broad construction, the first claim is clearly met by the Davisson patent, as well as by the patent of Nesmith; and claims 2, 9, 10, 11, 15 and 20 are evidently met by the Nesmith patent. I have distinguished between these claims, for the reason that claims 2, 9, 10, 11, 15 and 20 describe the central sections as geared together or geared directly together, whereas claim 1 describes the central sections as having rotary movement. It is undoubtedly true, however, that no invention could possibly be involved in substituting the directly engaging gears of the Nesmith machine for the rack and pinions of the Davisson machine; and assuming this to be true, none of these claims, if broadly construed, would present any invention in view of the Davisson patent.

I notice that in a number of the claims in question, the side sections are described as having not only the shifting motion required to transfer them from one center to another, but also rotary motion received from the central sections. I call attention to this, in order to point out the evident fact that in the Davisson machine, the spool hubs which support the spools and are transferred from cross-head to cross-head of the spindle, have not only the shifting motion, but also precisely the same rotary motion as the spool-supporting side sections of the Kitselman twisters; and that in the Nesmith machine, the spool-carrying frames have the shifting lateral movement of transfer from spindle to spindle and have likewise exactly the same rotary movement as the side sections in the Kitsel-
210 man twisters. None of the claims can therefore, express any novelty depending on the feature of constructon or operation thus described.

The claims under consideration being thus construed, the differences between the structure of the Kitselman machine, to which they refer, and the structure of defendants' machine are so evident and so radical as to clearly place the defendants' machine outside the scope of the claims. The spindles of the Kitselman machine not only rotate, but their rotation has the function of rotating the side sections which supplement the forward extensions of the spindles and make up with them the complete twisters. The defendants' machine, on the other hand has no rotating spindles, its horizontal tubes being, as I have pointed out, stationary and practically parts of the frame. The spool-carriers of the Kitselman machine are so formed as to make up with the spindle extensions completely cylindrical twisters, adapted to be held in the recess guides and transferred by means of the guides. The spool-carries of defendants' machine, on the contrary have no such relation to the rotating centers or gears of the machine that any gear with two spool-carriers can with any propriety be called a sectional twister. In fact, the whole shape and structure of the spool-carriers of defendants' machine is widely different from the structure of the spool-carriers of the Kitselman machine, the general structure and arrangement of the entire Kitselman twister being much more like that of the Nesmith twister than it is like that of defendants' machine. The

side sections or spool-carriers of the Nesmith machine are shifted from spindle to spindle by straight sliding movements; whereas the spool-carriers of defendants' machine leave one gear and follow another, in rotary paths, the change of support being effected by the rotation of the gears. The transfer of the Kitselman spool-carriers can only be effected when the central parts of the twisters are stationary; while in defendants' machine the transfer can only take place through and during the rotation of the gears. The spool-carriers of the Kitselman machine are transferred by means of sliding shifters operating in substantially the same way as the recessed shifters of the Whitehead machine of the British patent of 1854; but the spool-carriers of defendants' machine transfer from one gear to another adjacent to it, without the operation of any outside shifting or shipping mechanism. In this respect the shifting of the spool-carriers in the Kitselman machine follows an old and well-known plan of construction and operation, while that of defendants' machine employs a wholly novel construction, so far as I know.

211 It is, in fact, hard to conceive of a machine accomplishing the same result reached by the Kitselman machine, and yet more widely different from that machine in construction than is the defendants' machine. The result accomplished by the defendants' machine in the weaving of the diamond-mesh fencing was old long before the Kitselman patent, the fabric being made by machines having the same general features of operation as the Kitselman machine. The similarity of function of the two machines is therefore wholly immaterial; and, in my judgment, the Kitselman claims under discussion cannot be so construed as to cover defendants' machine, without at the same time including the Davisson and Nesmith machines. The defendants' machine does not contain the invention set forth in any one of the claims of the Kitselman patent submitted to me for consideration, the claims being construed in accordance with the evident requirements of the situation of the Kitselman patent in the art to which it pertains.

The third patent in suit, No. 357,067, issued February 1, 1887, to Theodore M. Connor, for improvements in machines for forming netted-wire fabrics, shows and describes a machine adapted to make the same diamond-mesh fencing with longitudinal warp wires, which has already been fully described. The Connor machine, like that of Nesmith or Davisson, is a stationary machine or loom, as distinguished from a field machine and has a stationary frame supporting its working mechanism. In this frame and between two parallel members or beams thereof are mounted a series of suitably supported hollow spindles provided with gears which are in successive engagement, so that the rotation of any one of the gears rotates them all, thereby rotating the spindles. Each of the spindles has near its ends correspondingly placed notched disks, the disks being so proportioned that in their rotation a notch of each disk overlaps or registers with the corresponding notch of an adjacent disk, once in each half revolution. These disks, being formed on horizontal spindles, are themselves in vertical planes, all the disks at the rear ends of the series of spindles being in one plane and all those at the

front ends of the spindles being in another plane parallel to the first. The planes of these disks are adjacent to two guide-plates also in vertical plane, each guide-plate being formed with a longitudinal opening made by a series of intersecting circles, the form of the resulting opening being clearly shown in Fig. 1 of the drawings of the patent, which illustrates one of the guide-plates and the relation of the working parts thereto. These intersecting circles are concentric with the respective spindles (it being understood that the openings in the front and rear guide-plates correspond exactly in shape and in their relation to the spindles; and the diameter of each of the notched disks is such that the operative notches in the disks are separated from the circular edges of the guide openings by a space sufficient to permit the insertion in the notches of the shafts of a series of spool-carriers, and the travel of these shafts along the margin of the guide openings in the guide-plates, the shafts of the spool-carriers being provided with anti-friction rollers impinging upon the edges of the guide, to secure the easy movement of the spool-carrier shafts. When in such working relation, the spool-carrier shafts are parallel with the hollow spindles of the gears and move normally in circular paths conforming to the movement of the notches in the disks by which they are supported. It is evident that whenever, in the rotation of the disks, a pair of notches in the disks of one spindle, bring a spool-carrier shaft into the plane passing through all the axes of the spindles, the notches so carrying the spool-shaft will at the same instant overlap or register with a corresponding pair of notches in the disks of an adjacent spindle; and the spool-carrier shaft will thus lie in the notches of two sets of disks, until they separate, through the further rotation of the disks. Furthermore, it is plain that when the spool-carrier shaft thus lies in the notches of the two adjacent pairs of disks, it is at the intersection between two of the incomplete circles making up the guide opening; and that by the interposition of any suitable switching mechanism, it may be forced to travel about either of the two contiguous circles. The Connor machine is provided with a series of switches, placed alternately on the opposite sides of each of the guide openings, each of the switches being at one of the points of intersection of two contiguous partial circles of the guide openings and being adapted to be so operated that when a spool-carrier shaft arrives at the intersection between two of the circles it may be forced to travel along the margin of either of them. The switches are provided with mechanism for operating them automatically, as the gears and their spindles rotate, the mechanism being so "timed" that each spool-carrier may make a given number of rotations in one circle of the guide-plate, may then pass to the next circle, making the same number of rotations therein and may then return to the circle in which it started, this motion being continued throughout the operation of the machine. During this movement each spool-carrier moves continuously, its motion, in one sense, being in the same direction, though in one circle it moves from right to left, whereas in the adjacent circle it moves from left to right. Its course may briefly be described as being the same

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as that followed by the hand in tracing a figure 8. In the actual use of the machine two spool-carriers are
213 mounted in the notched disks of a spindle; and it is evident that in the rotation of the two spool-carriers in a given circle the two spool-carriers must pass the same number of times about the center of the circle or the axis of the spindle. The spool-carriers are provided with spools carrying weft wires, and the warp wires of the fabric are carried through the hollow spindles on which the disks are mounted. The rotation of the spindles, while two spool-carrie-s are in the same circle, intertwists the two weft wires and wraps them about the warp wire; and the arrangement of switches is such that the two spool-carriers pass from a common circle to the two circles on opposite sides thereof, respectively, thereby remating the spool-carriers and the weft wires wound thereon. In other words, the mechanism thus described accomplishes the same result as the twisters and shippers of the Kitselman machine, the spindles, cross-heads, spool hubs, spools, and shippers of the Davisson machine, or the rotating gears, spool-carriers and shifters of the Nesmith machine. The only change made by Connor from the prior art is therefore the substitution of a different transfer mechanism in the place of those shown in the patents of Kitselman, Davisson and Nesmith.

Under these circumstances, it is evident that the claims of the Connor patent cannot be entitled to any broad construction, or to any construction covering a mechanism not operating on the same principle as that set forth in the patent and embodied in the spool-carrier rotating and shifting mechanism of the Connor machine. Furthermore, the invention which Connor made in providing this rotating and shipping mechanism was extremely slight. The Winsor patent No. 306,306, issued October 7, 1884, shows and describes a spool-carrier rotating and transferring mechanism having all the essential characteristics of the one used by Connor in his machine. Winsor uses a guide-plate having a guide-opening comprising a series of intersecting circles, the form of the guide-opening being identical with that of the one used by Connor, as may be seen by comparing Fig. 1 of the Connor patent with Fig. 1 and 6 of the Winsor patent. Within these intersecting circles are a series of spindles concentric with the circles; and on these spindles are mounted gears engaging each other in succession, precisely the same as in the Connor mechanism. Each of the gears carries a disk formed with two opposite sharp or acute-angled teeth, which take the place of the notches in the disks of the Connor machine; and the spool-carrier shafts, instead of lying in notches in the disks, as in the Connor machine, are themselves formed with notches which receive the teeth on the rotating disks, the spool-carrier shafts being thus rotated, so as to follow the margin of the guide-opening,
214 precisely as in the Connor mechanism. The disks in the Winsor machine are so arranged and their gears are in such engagement, that once in every half revolution, the tooth of one disk comes in line with the tooth of the next adjacent disk, at the intersection between two adjacent circles; and when the teeth thus

register, two of them are at the same time in opposite notches in the same spool-carrier spindle. The Winsor machine, like the Connor machine, has a series of switches, two on each side of the guide-opening, the same as in the Connor machine, and all the switches are connected so as to operate simultaneously and automatically, this connection of the switches being substantially the same in the Winsor machine as in the Connor machine. The Winsor machine is for a different purpose from that to which the Connor machine is designed; and the switches are not so timed as to give the spool-carriers the precise series of rotations desired in the Connor machine. Each of the switches of the Winsor machine, however, by its position, forces the spool-carrier to follow either one of two adjacent circles; and the shifting of the switches is for the purpose of causing the spool-carriers and their shafts to move in a predetermined path. The particular order of the successive movements of the spool-carriers of the Connor machine was not in itself matter of invention, as that was evident, from the function of the machine. Neither was there any invention in making the spindles of the gears in the Connor machine hollow, to carry the warp wires; for that was old in the machines of this class, such as the Kitselman, the Davisson and the Nesmith. What then did Connor invent? Nothing whatever but the cam mechanism for timing the throw of his switches. If his wire-fabric machine had needed the same series of movements of the spool-carriers found in the Winsor machine, the transfer of the rotating and shifting mechanism from the Winsor machine to the Connor machine would, clearly have involved no invention whatever; and in my judgment, Connor made no invention, as I have said, except the devising of mechanism to operate the switches in such a way as to effect the transfers of the spool-carriers at predetermined intervals, determined, not through any invention of Connor's, but by the requirements of the use of the machine, which had been discovered and made known prior to Connor's invention.

This being the position and degree of the Connor invention, it is evident that the claims of the patent must be construed in accordance therewith; and that in comparing such claims with structures alleged to infringe them, a proper inquiry is whether such structures operate in the specific way laid down in the Connor patent, and in so doing utilize the Connor invention. The two claims of
215 the Connor patent, of which infringement is alleged in this case, are claims 2 and 3, which are as follows:

"2. The combination with a train of intermeshing gears arranged in line, each gear having a hollow shaft, of notched spool-carrier disks, mounted on said hollow shafts, bobbin frames mounted in said notched disks, and automatic switches by which the bobbin frames are simultaneously withdrawn from the notches of those disks having similar rotation and lodged in the notches of the adjacent oppositely revolving disks, substantially as described.

3. The combination, with a train of intermeshing gears of equal diameter, mounted on prolonged hollow shafts arranged in line, of a corresponding series of spool-carriers mounted on said hollow shafts and having notched disks, bobbin frames having journals lying in

the notches of said disks, and switches by which the bobbin frames are each withdrawn from the notches in one pair of disks and lodged in the notches of the adjacent oppositely revolving pair of disks, substantially as described."

These two claims are substantially alike. With the exception that the gears of the Winsor machine above referred to have solid shafts instead of hollow shafts and the further exception that the disks of the Winsor machine have teeth engaging notches in the spool-carrier shafts, while in the Connor machine the disks have notches receiving the spool-carrier shafts, the Winsor device corresponds exactly to the terms of either of these claims. As I have said, the toothed disks of the Winsor device entering notches in the spool-carrier shafts are the exact equivalent of the notched disks in the Connor machine, receiving the spool-carrier shafts—the function of the two being exactly the same and one being the evident mechanical substitute of the other. Furthermore, there is no invention in substituting a hollow shaft for a solid shaft, in a general combination of elements like that set forth in either claim 2 or 3; and if the claim be limited to the use of the combination in the particular kind of machine under consideration, then the difference between solid shafts and hollow shafts was old and recognized before the Connor invention, the hollow spindles for the passage of the warp wires being old. There is, therefore, no invention whatever in either of these claims, unless the switches mentioned in each of the claims as an element be construed as limited by the description of their function, to their combination with the particular operating mechanism whereby they are so timed as to effect the specific rotation and transfer necessary in the operation of the machine.

In comparing these claims with the defendants' machine, it may be well to first compare the defendants' machine with the
216 Connor machine on which the claims are based, in order to determine whether the operation of the rotating and transferring mechanism in defendants' machine is the same in principle and results from the same construction, substantially, as that in the Connor machine.

Adjourned until tomorrow morning, October 7, 1898, at 10 o'clock a. m.; at the same place.

CHICAGO, *October* 7, 1898—10 o'clock a. m.

Parties met pursuant to adjournment; present as before.

Mr. Wiles, continuing his deposition, said:

The Connor machine has rotating spindles; and the rotation of the spindles effects the movement of the spool-carriers in the circular paths bounded by the margin of the guide-opening. The defendants' machine has no rotating spindles, nor does it need any. Each of the spool-carriers of the Connor machine has an axial shaft resting in the corresponding notches of two disks on the rotating spindle, the side walls of the notches being the means for pushing the spool-carrier shafts in circular paths, and the walls of the guide-openings being a necessarily added element for preventing outward

radial movement of the spool-carrier shafts and their consequent escape from the notches of the disks; or in other words, the notched disks of the Connor machine are not in themselves sufficient to hold the spool-carriers in proper relation to the rotating spindles, in the operation of the machine, but they must be supplemented by the external guides. The spool-carriers of the defendants' machine are each supported at end by one of the rotating gears, during any given period of operation, the gears and the parts fastened thereto and rotating therewith being the sole means for holding the spool-carriers in their operative relation to the gears which carry them. The spool-carriers of the Connor machine are transferred from spindle to spindle by means of switches outside of and added to the rotating spindles, the spool-carriers and the guides, the Connor machine in this respect being like the Nesmith machine, the Davisson machine, and the Kitselman machine, each of which includes switching or shifting mechanism external to the rotating centers and shiftable spool-carriers. In the defendants' machine, as I have before pointed out, the transfer or passage of the spool-carriers from spindle to spindle is effected, solely by the peculiar construction of the rotating gears and spool-carriers themselves, and without the intervention of any switching or shipping mechanism whatever. The spool-carriers of the Connor machine are transferred, at predetermined intervals in the continuous rotation of the spindles,
217 these intervals being invariable, except by a change of the switching mechanism, or of the mechanism by which the switches are timed. In the defendants' machine, the spool-carriers change their engagement with any two contiguous gears, by the reversal of the rotation of the gears; and the change of engagement of any given spool-carrier may be effected, whenever it is directly between the centers of two adjacent gears. The mechanism for supporting, rotating and transferring the spool-carriers in defendants' machine has not a single material feature in common with the features or elements having the enumerated functions, in the Connor machine. In one of the depositions on behalf of complainants, the gears of defendants' machine, with their rigidly attached front plates, notched to receive the spindles of the spool-carriers, have been compared with the notched rotating disks which carry the spool-carriers in the Connor machine, and these two elements of the two machines have been spoken of as equivalents. This statement evidently resulted from a misapprehension of the nature and function of the parts belonging to and rotating with the gears of defendants' machine, and a misunderstanding of the actual engagement and support of the spool-carriers.

As I have already said, the function of the notches in the disks that rotate with the spindles of the Connor machine, is to apply the rotative force to the shafts of the spool-carriers, and in that machine, the side walls of the notches push the spool-carrier shafts around in their circular paths. In the defendants' machine, the semicircular notches at opposite points in the margins of the front plates of the gears, have no such function—in fact they have no function whatever in the operation of the machine. The front plates are prefer-

ably made as large as possible, in order to overlap, as far as possible, the base plates of the spool-carriers, for the purposee of holding the latter firmly during their rotation. For this reason, the front plates of the gears are made so large that their margins, if not mutilated would be practically in contact, at the points where the spool-carrier spindles are placed—the plates being longer in the line joining these points than in the line *joining the points than in the line* at right angles thereto. It is evident, therefore, that in order to make room for the spindles between two adjacent plates, their margins must be cut away or notched; and semicircular notches have been cut out at the points where the spool-carrier spindles make contact with the edges of the plates, this form of notch being evidently the one that removes the least possible stock from the plate and thus decreases, as little as possible, the overlap of each plate on the base plate
218 of the spool-carrier, when in working relation to the gear. The side walls of these notches have nothing whatever to do with pushing the spool-carriers around in their circular paths, or with the rotation or transfer of the spool-carriers. These functions are effected by the spring pin on the front plate of each gear and the cast lug on the gear itself, through their engagement with the grooves in the base plate, which has already been fully explained and which may be clearly observed in the perforated model or three-gear machine to which I have before referred. Although I became clearly convinced of this fact, from a study of the model and of defendants' machine, I have thought it advisable to demonstrate it, before making this statement; and a small model or machine comprising three complete, full-sized gears of defendants' machine has therefore been mutilated to the extent of cutting away the side walls or points of one semicircular notch in each of two contiguous gears—the notches selected for such alteration being the two registering with each other once in every complete rotation of the gears. The operation of the parts having the notches thus deprived of their side walls (the notches being thereby obliterated) is precisely the same as it was before the change was effected; and the experiment fully demonstrates the correctness of my conclusion that the notches have no function in the operation of the machine, though it is undoubtedly desirable to cut away the stock of the plates in substantially the way practiced by defendants in making their machines, in order to have the plates project as far as possible over the base plates of the spool-carriers.

It has also been suggested that the plates at the front ends of the spool-carriers of defendants' machine are the equivalent of the notched plates at one end of the spindles of the Connor machine; but a moment's consideration of the function of the parts will show that this is a mistake. These plates on the spool-carriers are of such size as to practically make contact with the front ends of the horizontal tubes of the machine; and each of the plates, during certain parts of its movement, slides round the end of one of the tubes. The slight notches in the edges of the plate are so placed as to coincide with the tubes; and they undoubtedly rest against and conform to the surface of the tubes, during the actual forming of the twist of the wires—that is during the time when the strain on the spool-carriers

is least. The notches are not at all essential to the operation of the machine; and they certainly have no such propelling function as the notches in the rotating plates of the Connor machine, nor any function analogous thereto. The defendants' machine contains no parts, material to the issue in this suit, that can possibly be called equivalents of the corresponding elements of the Connor ma-
219 chine; and it is perfectly evident that the defendants' machine does not contain the invention or combination of parts set forth in either of the claims of the Connor machine to which my attention has been called.

The fourth and last of the patents in suit is U. S. patent No. 505,607, issued September 26, 1893, to John C. Pope, for wire-fabric machines. This patent shows and describes a machine substantially the same as the Kitselman machine No. 2, one of complainants' exhibits herein. The machine comprises a vertical frame bar with a suitable base, a series of stationary tubes mounted rigidly in the frame, a series of successively engaging gear wheels mounted on said tubes respectively and having straight parallel dovetail slots across their front faces, a series of spool-carriers having segmental bases provided with dovetail tongues adapted to fit and slide longitudinally in the dovetail grooves of the gears, vertically sliding guide-bars sliding on the vertical frame bar and having on their inner edges curved guide-plates conforming to the curved edges of the segmental bases of the spool-carriers, means for rotating the gears and means for reciprocating the sliding guide-bars. The curved guide-plates on the guide-bars embrace and conform to the segmental bases of the spool-carriers and are adapted to move the spool-carriers up and down, transferring them from one gear to another, when the gears are brought into such relation that their corresponding grooves are all in straight vertical lines. By means of this shifting function, the guide-bars and their guide-plates assemble the spool-carriers in pairs upon the alternate gears, the intermediate gears being empty; and at each operation of the guide-bars, the pair of spool-carriers on each full spool are transferred up and down to the adjacent empty spools, thus effecting the reassembling of the parts, in the manner and for the purpose common to all the machines of the class under consideration. It will be seen that the guide-bars and guide-plates of this machine have the same relation to the segmental bases of the spool-carriers, which is found in the vertically reciprocating guide-bars and transferable spool-carriers of the Kitselman machine, and furthermore, when the spool-carriers are assembled, in connection with the rotating gears, the guide-plates of this Pope machine form circular tracks in which the spool-carrier bases rotate, and by which they are held concentric with the gears, this function of the guide-bars and guide-plates being duplicated from the Kitselman machine, or for that matter, from the Whitehead machine of the British patent of 1854. The fundamental principle of this machine, not only in its general terms, but in the relation of the parts of its transferring mechanism, is therefore evidently the same as that of the Kitselman machine. What
220 has Pope done, in producing his machine, taking the Kitselman machine as a starting point? He has, in substance, cut

off the front end of each of the segmental spool-carriers of Kitselman, leaving the other segmental end to serve as the base; and he has provided the remaining segmental end or base of each spool-carrier with a dovetail tongue adapted to engage a corresponding groove on the front face of the rotating gear. These grooves, in each gear, are disposed in parallel lines and on opposite sides of the center; and the space between them corresponds exactly to the rear cross-bar of the rotating spindle in the Kitselman machine—that is, the cross-bar contiguous to the gear. The movement of his spool-carriers with reference to the gears remains precisely the same as in the Kitselman machine, the *the* movement of transfer is the same straight sliding motion found in the Kitselman machine, and the structure and operation of the guide-bars and their guide-plates is simply duplicated, in substance, from the Kitselman machine. It is true that there is only one guide-bar, or rather a single guide-bar on each side of the center in the Pope machine, whereas there are double guide-bars on the opposite sides of the Kitselman machine; but this is due simply to the fact that Pope has his spool-carriers supported at one end only, and each of them has but a single segmental head, whereas in the Kitselman machine, each spool-carrier had two segmental ends and was necessarily supported, guided and shifted by mechanism embracing both its segmental ends. What Pope has done then is to make a simplified Kitselman machine, embodying as its fundamental departure, the change from the Kitselman spool-carriers with two segmental ends, to the spool-carriers having segmental heads at one end only; and as a means of preventing longitudinal movement of the spool-carriers directly away from gears, at the same time leaving them free to slide from gear to gear, he has formed the bases with dovetail tongues engaging corresponding grooves on the gears. There could have been no invention in the mere change from spool-carriers supported at both ends to spool-carriers supported at one end, both these forms, or constructions being old in the prior art, as I pointed out in the general discussion of the art at the beginning of this deposition. I may now add, however, to the instances before cited, the patent of Winsor No. 306,306 and the patent to Connor No. 357,067, one of which shows spool-carriers supported at their bases only, while the other shows spool-carriers supported at both ends, the spool-carriers being rotated and shifted in the same way, as I have already pointed out in comparing these two patents. Another example of slidable spool-carriers supported at their bases only and engaging slotted gears is to
221 be found in U. S. patent No. 432,951, issued July 22, 1890, to Edward S. Morgan, for improvements in wire-fence machines, the structure shown in this patent being exemplified, in substance, in Defendants' Exhibit Cochrane Machine heretofore offered in evidence herein. This machine, in all substantial particulars, is the same as the one shown in the Morgan patent. The patent does not show the hollow spindles projecting forward from the centers of the slotted plates, which receive and rotate the gears; but the engagement and movement of the spool-carriers in this machine is exactly the same as in the machine shown and described in the Morgan

patent. In view of this Morgan patent and of the Kitselman patent, it is evident that the Pope invention is extremely narrow. The radial slots in the rotating plates of the Morgan machine have exactly the same function as the dovetail grooves in the faces of the gears of the Pope machine. The spool-carriers of the Morgan machine (or Cochrane machine) rotate in pairs with the alternate rotating plates, being held by their bases during such rotation, in the same way as the spool-carriers of the Pope machine. The spool-carriers of the Morgan machine are shifted from one rotating center to another by sliding them vertically, and so are the spool-carriers of the Pope machine. The shifting mechanism of the Morgan machine is not like that of the Pope machine; but the shifting of the Pope machine was old before Pope made his invention. The frame proper of each of the spool-carriers of the Morgan machine has an axial shank extending through the slots in the rotating plates; and on the rear end of this shank there is a broad plate lying back of the rotating plates and forming a head to prevent the escape of the spool-carrying frame. This is the same kind of a lock as a dovetail tongue and groove; and the whole construction of these parts in the Morgan machine is such as to perform the same function as that of the corresponding parts in the Pope machine and perform it in the same way—the spool-carriers being locked to the rotating plates by the enlarged heads of the shanks and the shifting being accomplished by a straight sliding movement the same as in the Pope machine. In view of the prior art, as thus stated, the invention of Pope, so far as it relates to the gears, the spool-carriers and the means of engaging and disengaging the gears and spool-carriers, must evidently be confined to the specific construction shown and described in the patent; and it is in fact doubtful whether this involves any patentable invention. It is asserted, however, that the stationary tubes, or stationary spindles of the Pope machine involve a valuable feature of invention as compared with the rotatable spindles of Davisson or Kitselman or Connor. It is perfectly evident that
222 these stationary tubes add no new function or capability to the machine; and that the substitution in the Pope machine, of spindles rotating with the gears, for the stationary tubes, or the exchange of stationary tubes for rotating tubes is a matter of mere mechanical choice and one that cannot possibly involve invention. It was common, long before the Pope invention, to rotate a gear with its shaft, whether solid or tubular, or to rotate a gear on its shaft, as convenience might dictate; and in two patents which have been shown to me as illustrating wire-and-slat fence machines of earlier date than the Pope patent, the two constructions thus referred to are shown in exactly the same relation and use. These patents are U. S. patents No. 309,724 to Middaugh and Wilcox, for improvements in portable fence machines (dated December 23, 1884) and No. 347,064, issued August 10, 1886, to William H. Reppeto, for improvements in wire-fence machines. Fig. 4 of the Middaugh and Wilcox patent, shows the twisters of the machine in section; and from this figure it is apparent that the cylindrical tubes G G are stationary, that the gear wheels rotate on those tubes and that the

perforated twisting plates rotate with the gears, all the gears being in successive engagement. The hollow twister of the Reppeto machine is shown in section in Fig. 6; and it is evident from this drawing that the tubular spindle and gear are made in a single piece and rotate together, the perforated twisting cap being mounted on the spindle. Aside from any such instances of the interchangeability of stationary and rotating spindles in machines or patents prior to the Pope patent, it is clear from an inspection of the machine of Pope that it is wholly immaterial whether the spindle rotates or not and that no possible invention could be based upon the use of a stationary spindle instead of one free to rotate, or the substitution of a rotatable spindle for one rigidly fastened to its frame. It has been suggested that the stationary spindle may avoid a certain amount of rubbing or abrasion of the warp wire which would be caused by the use of a rotating spindle. This difference seems to me purely theoretical and not based on any actual difference in use; but if it were true, and if the difference proved to be important in the respect suggested, the substitution of the stationary spindle for the rotatable spindle would still be a mere matter of mechanical choice open to the free use of every builder of a machine.

My attention is called by the question to claims 1, 9 and 10 of the Pope patent, which are as follows:

1. In a wire-fabric machine, the upright frame piece having a series of regularly spaced openings, stationary elongated warp-
223 wire tubes fitted at one end in said openings, a vertically aligned series of intergeared twister wheels loosely journalled on said stationary tubes and having parallel face grooves, shiftable spool-carriers having tongues registering with the grooves in said wheels, and shifting devices for sliding the spool-carriers from one wheel to the other, substantially as set forth.

9. In a wire-fabric machine, the upright frame having openings, stationary warp-wire tubes secured to said frame and aligning with the openings therein, a series of aligned twister wheels loosely journalled on said stationary tubes, and shiftable spool-carriers mounted to slide on said wheels, substantially as set forth.

10. In a wire-fabric machine, the upright frame having openings, stationary warp-wire tubes fitted at one end in said openings, a series of aligned twister wheels loosely journalled on said stationary tubes, and shiftable spool-carriers having a sliding tongue and grooved connection with the twister wheels, substantially as set forth.

In the original application for the Pope patent, as filed in the Patent Office, there were two other claims which were afterward erased, upon their rejection by the examiner, the two claims being as follows:

1. In a wire-fabric machine, the combination of a vertically aligned series of intergeared twister wheels having face grooves, and shiftable spool-carriers having slide-tongues adapted to fit in the grooves of said wheels, substantially as set forth.

3. In a wire-fabric machine, the frame, a vertical series of warp-wire tubes secured in and projected from said frame, a vertically aligned series of twister wheels journalled on said tubes and having

face grooves and shiftable spool-carriers adapted to fit in the face grooves of said twister wheel, substantially as set forth.

These claims were rejected on the patent of Whitney, No. 484,528, of October 18, 1892, the patent of Morgan, No. 432,951, of July 22, 1890, being cited as an added reference to claim 3. The erasure of these claims and the admission that the combinations of elements which they recited were old would seem to clearly limit the invention to the specific construction set forth in the specification of the patent and shown in the drawings—namely that distinguished by the form and function of the grooves from a combination including the frame the vertical series of warp-wire tubes secured in and projected from said frame, the vertically aligned series of twister wheels journalled on said tubes and having face grooves (not limited as to their form) and the shiftable spool-carriers adapted to fit in the face groove of the twister wheels, this latter combination being the one set forth in erased claim 3 and being an exact description of the structure of the Pope machine, with the exception of the form of the grooves and the tongues fitting therein.

224 Comparing the claims with the defendants' machine, I may say first that defendants' machine is not within the meaning of the claims, taking their language in its ordinary significance and paying no attention whatever to the state of the art or the nature of the Pope invention, as pointed out in the comparison of the Pope machine with the prior art. The defendants' machine does not have gears having parallel face grooves, shifting spool-carriers having tongues registering with the grooves in the wheels, or shifting devices for sliding the spool-carriers from one wheel to the other, this being the description of these parts in claim 1. The defendants' machine does not have shiftable spool-carriers mounted to slide on the rotating wheels, and therefore does not conform to the description in claim 9; and the defendants' machine has no shiftable spool-carriers having a sliding tongue and groove connection with the twister wheels, this being the descsiption of the relation of the parts found in claim 10. The spool-carriers in the defendants' machine do not transfer by sliding from one wheel to the one next it. They transfer at the instant of the beginning of reverse rotation of the gear wheels; and they never move at all until the transfer is effected. As I have said before, any one of the spool-carriers of defendants' machine, when midway between two adjacent gears, is as much in engagement with one of them as with the other. No sliding movement is therefore needed to effect its engagement with either gear; but the gear which starts to turn in the right direction takes the spool-carrier with it. There is no similarity of movement between the Pope machine and the defendants' machine, in the transfer of the spool-carriers; and the claims, read according to their terms and without any limitation, describe a construction and a movement that cannot be found in defendants' machine. Furthermore, although claims 9 and 10 do not include the shifting mechanism which is made an element of claim 1 of the Pope patent, such shifting mechanism is by implication an element of the combination of each claim, since without it the combination is inoperative, the

sliding of the shiftable spool-carriers of claim 9 and the shifting of the spool-carriers having the sliding tongue and groove connection with the twister wheels, in claim 10, being dependent for their operation, on the shifting mechanism. The patent does not disclose or suggest any construction in which the spool-carriers may have their sliding shifting movement, without the use of shifting mechanism; and the defendants' machine neither has nor requires any shifting mechanism whatever, aside from the peculiar construction and engagement of the rotating gears and spool-carriers themselves.

225 Not only does the plain and evident meaning of the claims exclude the defendants' machine from their scope, but the language of the claims can only be fairly applied to the actual invention of Pope, when the claims are so construed as to limit them to the specific mechanism shown and described in the patent. When thus construed, they evidently set forth combinations of elements which are not found, specifically or in substance in the defendants' machine. In fact, the Pope patent discloses a very limited change or improvement in the construction of the rotating gears and spool-carriers, whereby the spool-carriers are rotated with and are adapted to be shifted between the gears; while the defendants' machine embodies a wholly different departure in the structure of the rotating gears and spool-carriers—one not only wholly unlike that shown and described in the Pope patent, but wholly unlike anything shown in the prior art. It would be impossible to draw claims giving any proper definition of Pope's invention, which could include the mechanism embodied in the defendants' machine. The defendants' machine does not contain Pope's invention, however the latter may be stated; and it clearly does not contain the combination of parts enumerated in any one of the claims of the Pope patent which have been submitted to me for consideration.

Q. 5. Please state whether or not you have ever witnessed the operation of making fence on a machine like any of those about which you have been testifying?

A. I have seen the defendants' machine, the Kitselman machine and the Pope machine in operation at the factory of the defendants in Kokomo, Indiana. They were all making the diamond-mesh fencing with parallel warp wires, which I have described in this deposition. I also saw the defendants' machine operated to make a style of fencing in which the woof wire is carried vertically from one warp wire to another and wrapped about each of the warp wires.

Q. 6. Please state whether or not you have found in your investigation of this case any patent on the defendants' machine—illustrating, describing and claiming it in its construction and mode of operation.

A. The defendants' machine is fully illustrated and described in letters patent of the United States No. 552,025, issued December 24, 1895, to Willie D. Whitney for improvements in wire-fabric machines.

Q. 7. Look at this patent No. 505,890, issued October 3, 1893, to

Willie D. Whitney, and state how far you find the machine illustrated and described in such patent contains or exhibits the
226 combinations described and called for in the first, ninth and tenth claims of the Pope patent which you have been considering.

A. This patent shows and describes a machine which in all substantial particulars is the same as the one shown and described in the Pope patent in suit. In the machine shown and described in this Whitney patent, the rotating gears are provided with dovetail tongues and the segmental bases of the spool-carriers are formed with corresponding grooves; but the relation of the tongues and grooves and the operation of the parts is the same in this Whitney machine as in the Pope machine. The Pope patent was issued September 26, 1893, and the Whitney patent was issued October 3, 1893; but Whitney's application was filed April 14, 1893, while the Pope application was not filed until May 2, 1893.

By Mr. BANNING: Counsel for defendants offers in evidence the following United States and British patents, and model drawing, and file-wrappers referred to by the witness in his deposition, namely:

U. S. patent No. 10,743, April 4, 1854, to John Nesmith.

U. S. patent No. *No.* 209,520, October 29, 1878, to Caleb K. Sawyer.

U. S. patent 218,323, August 5, 1879, to Isham Sedgwick.

U. S. patent 233,033, October 5, 1880, to Isham Sedgwick.

U. S. patent No. 312,063, February 10, 1885, George Q. Adams.

U. S. patent No. 298,368, May 13, 1884, to John M. Fultz.

U. S. patent No. 309,724, December 23, 1884, to Middaugh & Wilcox.

U. S. patent No. 347,064, August 10, 1886, to William H. Reppeto.

U. S. patent No. 322,972, July 21, 1885, to Sam Watson.

U. S. patent No. 310,254, January 6, 1885, to Hiram S. Combs.

U. S. patent No. 306,306, October 7, 1884, to Joseph S. Winsor.

U. S. patent No. 432,951, July 22, 1890, to Edward S. Morgan.

U. S. patent No. 484,528, October 18, 1892, to Willie D. Whitney.

British patent No. 1285, of 1854, to John Whitehead.

British patent No. 2516, of 1876, to William Smith.

The three models referred to by the witness which are marked respectively, "Defendants' Exhibit, Perforated Model" and "Defendants' Exhibit, Mutilated Model," and "Defendants' Exhibit, Nesmith Model."

A certified copy of the file-wrapper and contents of the Kitselman patent, No. 356,322, sued on, and a certified copy of the file-wrapper and contents of the Pope patent, No. 505,607, sued on.

227 The drawing referred to by the witness and the same is marked "Defendants' Exhibit, Illustrative Drawing."

Adjourned until tomorrow morning, October 8, 1898, at 10 o'clock a. m.; at the same place.

CHICAGO, *October* 8, 1898—10 o'clock a. m.

Parties met pursuant to adjournment; present as before.

Cross-examination of Mr. WILES by Mr. PARKINSON:

X Q. 8. You speak in answer 5 of having seen the defendants' machine, the Kitselman and the Pope in operation at the factory of the defendants; is this the only time that you have seen either of these machines in operation?

A. It is.

X Q. 9. When was this?

A. It was about a month ago I should say.

X Q. 10. It was after your employment in behalf of the defendants in this case, was it?

A. It was.

X Q. 11. Where and when have you ever seen any full-sized operative machine built under or in accordance with either of the patents to which you have referred as representing the prior art?

A. I have never seen a machine built in accordance with the specification and drawings of any of the patents of the prior art.

X Q. 12. When and where have you ever seen any machine for manufacturing wire-mesh fence other than the machines you saw at Kokomo, as stated in answer 5? and the physical exhibits which are in evidence here?

A. I have never seen, or at least I have never noticed any machines for manufacturing diamond-mesh fencing, (or other wire-mesh fencing,) except the machines in evidence as exhibits in this case and the machines which I saw at Kokomo, Indiana, as stated in a previous answer.

X Q. 13. The machines which you saw at Kokomo were exhibited to you by the defendants, were they?

A. They were shown to me by Mr. Frederick and other gentlemen connected with the Kokomo Fence Machine Company.

X Q. 14. Which of the exhibits prior to the Davisson patent do you regard as most nearly or most completely embodying the invention recited in the second and third claims of that patent? Please name the one prior patent or exhibit which in your opinion exhibits the nearest approach?

228 A. The Nesmith patent No. 10,743.

X Q. 15. You have never seen any machine purporting to be built under the Nesmith patent or corresponding construction to that patent, have you?

A. I have never seen any mechanical structure built in accordance with the specification and drawing of the Nesmith patent, or alleged to be built in accordance therewith, except the model to which I have referred in my deposition.

X Q. 16. You do not consider that model as representing a complete machine corresponding to the Nesmith patent, do you?

A. It is not a complete machine corresponding to the full description and illustration in the Nesmith patent. It only represents the rotating gears or spindles of what Nesmith calls the feeder of his

machine, the spool-carriers adapted to be rotated by the spindles and shifted between them and the shifting mechanism whereby such shifting movement is accomplished.

X Q. 17. Do you know when and by whom this "Nesmith model" was made?

A. I do not. The model was shown to me at Mr. Banning's office immediately after I was retained as expert in this suit.

X Q. 18. I notice in this model that while one of the shifting frames carries a blunted V-shaped shifting devices, the other carries shifting devices which at each side represent one-half the V and in the center a slotted V. Where in the drawing or description of the Nesmith patent do you find these last-mentioned shipping devices in the shape shown in the model?

A. In my discussion of this model in my direct examination, I called attention to the fact that the shippers having each two blunt-ended wedges or V's correspond to the illustration of the shippers S in Fig. 4 of the Nesmith patent; and that the other or reverse shippers V V are not shown in the drawings of the patent, though their function and operation is clearly described therein. The specification fully explains that as one set of shipper S S move up, the other set V V move down; and that while the shipper S S, which are illustrated in the drawing, move the spool-carrying frame in certain given directions with relation to the gears, the shippers V V move them in the opposite direction. No description of the specific form of the shippers V V being given, it is a reasonable assumption that they are to be constructed on the same principle as the shippers S S. This would necessarily bring one complete V point on each of the shippers V V between the two points of each of the shippers S S;
229 and would locate oppositely inclined wedges on the outer sides of the machine and outside the two V-shaped points of each of the shippers S S. Furthermore, as the patent describes the machine as operating with longitudinal wires passing through perforations in the outermost rotating gears, it is perfectly evident that the outermost limits of the shippers V V must be so formed as not to interfere with such longitudinal or warp wires when the shippers are raised. This would indicate that the outer ends of the shippers V V must be formed substantially as they appear in the model.

I further called attention in my direct examination to the statement of the specification of the Nesmith patent that the machine is adapted to make a fabric of less width than the whole number of rotating spindles or gears; and it is evident that if this suggestion is to be carried out, the gears intermediate between the outermost one must be axially perforated for the passage of the marginal wires of such narrower fabric, and that the points of the shippers must be vertically slotted in order to prevent their collision with such wires as they are raised. The slots in the V-shaped central members of the shippers referred to in the question are simply an illustration of the manner and purpose of such vertical slotting. It will be observed that the blunt V-shaped parts of the other pair of shippers have not been so slotted; but the slots in one pair are a sufficient

illustration of this matter. In my judgment, the construction of the shippers not shown in the drawings of the Nesmith patent is evident from the description of their function in the specification, in view of the form of the shippers that are shown in the drawings.

X Q. 19. Do you know who designed and applied in this model the shifting devices you say are not shown in the drawing of the Nesmith patent?

A. I do not.

X Q. 20. You were informed by defendants that they got up this model for use in this litigation since the suit was commenced, were you not?

A. That is in exact accordance with my statement to counsel off the record and that is the fact.

X Q. 21. Referring now to the claims of the Kitselman patent here in controversy which of the patents prior to the Kitselman patent to which you have referred do you regard as most closely approaching or most nearly embodying the inventions recited in those claims?

A. I think perhaps the Nesmith patent, taken alone, furnishes the best embodiment of the invention set forth in the claims of the Kitselman patent, if those claims be broadly construed. The
230 Davisson machine—that is the machine shown in the Davisson patent in suit, is another embodiment of the same broad idea of construction and operation as that set forth in the Kitselman claims; and the British patent of 1876 referred to in my deposition, in view of which Kitselman struck out certain claims of his application, contains a brief description applying exactly to the Kitselman structure.

X Q. 22. What you refer to in your last answer as the British patent of 1876 is not in fact a patent is it? but merely a provisional specification unaccompanied by any drawing or illustration.

A. That is true.

X Q. 23. Referring now to the Connor patent, which of the prior patents or exhibits to which you refer do you regard as the most nearly embodying the invention recited in the claims of that patent here in controversy?

A. There is no prior patent that embodies the exact combination of elements set forth in either of the claims of the Connor patent which I was asked to consider—namely claims 2 and 3. The Winsor patent No. 306,306, is a complete anticipation of the claims, term by term, except that the shafts of the Winsor gears are solid, instead of hollow. Connor merely transferred the Winsor gearing to a diamond-mesh fencing machine and made the shafts hollow or tubular, instead of solid, because the passage of the warp wires necessitated the use of such hollow shafts. The hollow shafts had already been shown by Davisson and Kitselman, as well as by Nesmith. In my direct examination, I pointed out the fact that the transferring disks of the Winsor machine are formed with teeth entering sockets in the spool-carrier spindles, instead of being formed with notches to receive the spool-carrier spindles. One construction is the evident equivalent of the other and accomplishes the same function. The only change of the Winsor transfer mechanism which Connor made,

that could possibly require invention, was in so arranging the timing mechanism for throwing the switches, as to give the spool-carriers the necessary number of rotations between their transfers from one center to another.

X Q. 24. Am I to understand then that you regard the Winsor patent as the closest approach you find in the prior art to the invention recited in the second and third claims of the Connor patent?

A. As I have said, the Winsor patent is a complete anticipation of the claims, taken according to their terms. Neither of the claims limits the mechanism to its use in a machine of the special class under consideration, or limits in any way the number of rotations which each spool-carrier is to have between its transfer-
231 ences from one circle to another. Of course, if the nature of the machine to which the gearing is applied is taken into account, all the machines embodying the same general line of elements must be taken into account in determining Connor's invention. This would include the machines shown in the patents of Nesmith, Davisson and Kitselman.

X Q. 25. Please give me a direct answer to the question which I now put for the third time: Do you mean to be understood as stating that the Winsor patent exhibits the closest approach to the invention recited in the second and third claims of the Connor patent of any exhibit to which you have referred in the prior art? If not, please name the one prior patent or exhibit which you do so regard.

A. I have given counsel a complete answer to this question: but I am perfectly willing to state it again. When Connor came into the field, the patents of Nesmith, Davisson and Kitselman had developed completely the general combination of elements required for such a machine as Connor produced. These machines all included hollow rotating spindles, spool-carriers detachably mounted on the spindles and rotating with them, and means for transferring the spool-carriers from spindle to spindle. Connor's change or improvement consisted in substituting for the prior forms of spool-carrier engagement with the spindles and transference from the spindles, another form or construction; and that form he found ready made in the Winsor patent. His claims 2 and 3 are claims for the Winsor mechanism and nothing else, except that the gear shafts are described as hollow, instead of solid, the construction in this respect being that found in any of the three prior machines to which I have referred. I say again that if the claims are to be read without explanation from the specification, they are completely met by the Winsor patent. If we go to the specifications and drawings of the Connor patent for explanation, we find that Connor arranged his timing mechanism to throw the switches so as to secure the specific method or order of movement of the spool-carriers required for making diamond-mesh fencing; and this change was Connor's invention. The moment we go back to the Connor specifications and drawings and take into account the nature and function of the machine, the patents of Kitselman, Davisson and Nesmith become pertinent references; and they should necessarily be considered in connection with the Winsor patent in deciding what Connor invented. So far

as these three patents are concerned, any one of them is as pertinent to Connor's invention as any other.

X Q. 26. I will make one more effort to get a direct answer to my question and if this fails will probably pass the matter. I
232 want you to state what one prior patent in your opinion embodies the closest approach to the invention claimed in the second and third claims of the Connor patent and in answering it you may assume that the claims of that patent are to be read as such claims usually are in connection with the specifications and drawings.

A. I have no intention whatever of pointing out a single patent in answer to the question. The Davisson patent or the Kitselman patent is a complete anticipation of everything in the Connor machine, except the transfer mechanism which is anticipated in the Winsor patent—it being understood that in this statement I do not include the particular combination of switches and timing mechanism which constituted Connor's invention.

X Q. 27. Which of the patents or exhibits to which you refer as prior to the Pope patent, do you regard as most nearly embodying the invention recited in the first, ninth and tenth claims of that patent?

A. On the whole, the Kitselman patent discloses the nearest prior embodiment of the combination of elements found in the Pope machine or recited in claims 1, 9 and 10 of the Pope patent. The Morgan patent presents many features of construction analogous to the corresponding elements in the Pope machine; and the wire-and-slat machine patents of Middaugh & Wilcox and Reppeto show the interchangeability of stationary and rotatable spindles.

X Q. 28. Do you mean to represent that when you as a solicitor of patents amend an application by withdrawing claims to which the examiner has objected either substituting therefor other claims differently expressed or relying upon claims already approved by the examiner you therefore concede that everything recited in the claims thus withdrawn was old at the date of the invention of the applicant?

A. I understand that to be so, provided the withdrawal or erasure is in compliance with a rejection based on the merits and not on matters of form. For instance, an examiner might strenuously and perhaps correctly insist that a specification contained claims which were mere duplicates and he might for that reason require erasure of certain claims. The erasure of the claims, under such circumstances, is evidently not an admission. Again the examiner, without citing references or attempting to pass upon the merits, may object to the form of claims and the applicant may agree with him and modify the claims, as to form, without any damaging admission. I understand, however, that if an examiner takes the position that a claim in one of my pending applications is not patentable,
233 because it is shown in the prior patents, my erasure of the claims is an admission that the examiner is right in his position; and I do not intend to erase claims under such circumstances, unless I think the examiner is right.

X Q. 29. Where certain claims of an application are rejected by the examiner as not in his opinion containing patentable invention sufficient to distinguish them from the prior references or because he does not regard the terms of the claims as satisfactorily marking the distinction between the invention of the applicant and that exhibited in prior patents, do you not sometimes erase such claims notwithstanding you regard the subject-matter in them as novel and patentable and substitute for them other claims which you consider as equally broad, but as likely to be more satisfactory to the examiner or to mark the same distinctions more clearly and do you not, in other cases, where there is a similar rejection and where you consider the subject-matter of the claim as novel and patentable but have other claims already allowed which in your opinion adequately cover that subject-matter, withdraw the claims thus objected to and rest upon the claims which you consider as adequate to cover that subject-matter without intending to concede thereby that everything embraced in the rejected and withdrawn claims is old?

A. I may say that I do not and cannot follow what I consider an ideal practice. I often accept claims because the best that can be secured without appeal, as I am obliged to do in compliance with the wishes of my client. It may often happen, as suggested in the question, that a claim is rejected and at the same time other claims, not as broad in their terms stand ready for allowance; and I may think that such allowable claims will probably afford adequate protection. In such a case, I should use my judgment, influenced perhaps by my client's views and act accordingly,—either erasing or appealing. If the question is merely one of terms, that will appear in the correspondence; and the question whether the difference of terms is really a difference of substance is one that must be considered in deciding whether to comply or not comply with the examiner's requirements. If the examiner, however, simply rejects the claim in view of certain references and I strike it out without explanation, that in my judgment is an admission that the claim was properly rejected and that the subject-matter of the claim, as stated in the claim, is old.

X Q. 30. You would regard that as an admission that everything recited in the claim was old notwithstanding there were other claims
234 allowed either before or subsequently, which embraced the same subject-matter in terms which were quite as broad but which by reason of differences of expression had been allowed by the examiner, would you?

A. I do not think that the subsequent allowance of claims has any bearing on the force of the admission embodied in the erasure. The significance of the erasure must clearly be determined from the condition of the whole case at the time the erasure is made. If certain claims of an application are rejected by the examiner, while certain others are in his judgment allowable, it must be because of some differences distinguishing the allowable claims from those rejected; unless the rejection is based on the statement that the claims are duplicates, or that the rejected claims need amendment in some matter of form. I should say that by erasing any rejected claim

and accepting another claim not objected to by the examiner, the applicant admitted the difference distinguishing the claims from each other and admitted that the rejected claim lacked the novelty which was given to the remaining claims by reason of such difference.

X Q. 31. Has it never happened in your experience as solicitor that where a claim was rejected upon references that were so plainly inadequate as to indicate that the examiner had misapprehended the nature of the claim or the nature of the reference the attention which you gave to the matter in examining the reference had suggested to you that the claim might be better expressed and yet cover quite as much as or more than it covered in its first form, and at the same time the changes in expression might bring more clearly to the examiner's mind the distinction between the subject-matter of the claim and the reference, and that you have under such circumstances, withdrawn the claim to submit a substitute claim quite as broad in its effect and without intending thereby to admit that everything that the claim as first drawn embraced was old?

A. It is undoubtedly true that claims are often erased in view of insufficient reference, simply because it is too troublesome or expensive to contest them. Furthermore, it is undoubtedly true that claims of an application may be erased and replaced by much broader claims, although the combinations set up in the narrower claims were completely anticipated by the references. I have no doubt, however, that whenever an applicant erases a claim after its rejection on the ground of lack of novelty, he admits that the combination set forth in the claim, as stated in the terms of the claim, is lacking in patentable novelty; and he takes the chances on his other claims being properly distinguished from the claim he erased.

X Q. 32. Then you as a solicitor understand, do you, that
235 if an applicant withdraws after rejection a claim for which he at the time of withdrawal submits a differently expressed claim upon the same subject-matter in terms quite as broad as the withdrawn claim and procures the allowance of the substituted claim, he in so doing admits that all that was embraced in the withdrawn claim was old?

A. I think he admits that in view of the references the erased claim sets forth a combination which is not patentably novel.

X Q. 33. You think he does that by the very act of asserting in terms as broad or broader that he is entitled to that subject-matter and by pressing the claim embracing it to allowance, do you?

A. I think that when the applicant erases a claim and substitutes another, he says in effect, it is true that the claim formerly rejected on its merits was not patentably novel; but I now present one that is; and if the claim is allowed, the natural presumption is that the examiner sees in the new claim some distinction which makes it patentable, whereas the old claim was not patentable.

X Q. 34. Did you ever encounter an examiner, who, having rejected the claim upon an erroneous conception of its meaning or of the nature of a prior reference, had such pride of opinion that it was

much easier to persuade him to allow a claim covering the same subject-matter or even a broader claim if expressed in somewhat different language, than it was to persuade him to withdraw his objection to the terms of the claim as it stood, and did you never under such circumstances submit a claim in lieu of one withdrawn which was intended to cover all that the original claim was intended to cover, and obtain the allowance of such substituted claim?

A. I do not now recall any case in which I had exactly that experience. I should say that my experience has been that where a claim is rejected by an examiner having any intelligent understanding of the case and any fixed attitude in relation to it, I have been obliged, either to remove the examiner's objections by explanation and argument, or to modify the claims by the insertion of some limitation sufficient in the examiner's mind to distinguish the subject-matter of the claims from the references cited by the examiner. It sometimes happens of course that these apparent limitations are of no consequence whatever and do not in fact narrow the scope of the claims—though in form the claims seem narrow. Nevertheless, in my judgment, the applicant, in accepting the modified claims, takes them as the measure of his invention; and if the changes are material, he has to that extent conceded away that which he claimed originally to be his.

236 X Q. 35. If after rejection upon a prior reference which in your opinion, does not at all meet the claim as already expressed, it occurs to you that you can improve the phraseology of the claim while still covering the same subject-matter intended to be covered by it as originally drawn and instead of insisting upon the claim in its first form, you substitute a claim with the improved phraseology aptly covering the same subject-matter and press that claim before the examiner and obtain its allowance, do you understand that by so doing you have conceded that the subject-matter thus embraced in the improved claim and which you regarded as in the first instance, substantially embraced in the first draft of the claim, has been admitted to be old?

A. I believe that when an applicant erases a claim that has been rejected by the examiner for alleged lack of patentable novelty, he admits that the claim as framed did not present patentable novelty, in view of the reasons given by the examiner. If while so erasing a claim, he files another claim relating to the same general subject as the erased claim, the presumption is that the new claim differs from the old one; and if the examiner allows the new claim, the presumption is that the examiner concedes that the new claim is for a different matter from that expressed in the formerly rejected claim—otherwise the new claim should likewise be rejected on the same references cited to the old one. I understand the rule to be that when an applicant has erased a claim, rejected for lack of patentable novelty, he cannot again insert the same claim by amendment; and such a rule must be based on the theory that the applicant has admitted that the erased claim did not state patentable matter.

X Q. 36. If you presented a bill for $125.00 and when your client objected to paying it discovered that you had made a blunder and

that it should have been $135.00 and instead of sending back the old bill sent in a bill for $135, you would understand that by so doing you would have admitted conclusively that the $125 was not due you? would you? and if the client afterwards admitted the correctness of the $135 bill and paid it, you would think that he could sue and recover back the $125 on the ground that by not returning the $125 account you had admitted that that was not due you, would you?

A. Whatever I might think about this supposed difference between myself and my client, I cannot see that it has the slightest relation to the question of law about which counsel has examined me for some time.

X Q. 37. Supposing you had made a claim which included as one of its elements a device described in the claim as having a
237 certain specified shape, and after that claim was rejected on reference to a prior patent you should conclude that this limitation was entirely unnecessary and had been carelessly expressed and that you were entitled not only to the claim as it originally stood, but to it broadened by the removal of this limitation, and should redraw the claim in the same terms as before except that this restriction was omitted and should obtain the allowance of the claim thus redrawn, would you understand that by thus amending the claim or redrawing it you had admitted that all that was embraced in *in* it originally was old?

A. There is no doubt that the erasure of a claim may be accompanied by such statements as to negative any force which it might otherwise have as an admission. Thus, for instance, the erasure of the claim might be accompanied by the explicit statement that the applicant denies that the claim is met by the references cited by the examiner, but that he erases the claim and substitutes another different in form though not in substance. Such a statement would evidently avoid any implication arising from the mere cancelling of the claim. In the same way, it is possible that the filing of a substitute claim, precisely like the erased claim, except for the omission of an evident limitation found in the first claim, might be so clear a restatement of the applicant's right to the matter contained in the original claim, and of his right to a still broader statement of invention, directly including that set forth in the original claim, as to negative any implication of surrender of the matter set forth in the claim so cancelled. If, however, the erased claim is replaced by another having limitations not found in the original claim, the erasure of the original claim and the filing and acceptance of the new claim is in my judgment an admission that the original claim was not patentable and that the new claim is patentable, by reason of the limitation.

X Q. 38. If the substituted claim is in terms one fitly framed to cover the same subject-matter or to cover a broader scope than the one for which it was substituted, is not the fact of filing such claim notice to the examiner that the applicant insists upon whatever is embraced in it without having that notice repeated in a letter or by an oral statement?

A. Not necessarily. In the case stated in the last question preceding the present one, counsel suggested the filing of such a claim as would be unmistakable notice that the applicant still claimed everything specifically included in his erased claim as well as other matter included therewith in a broader statement. Where, however, one claim is erased and another of different phraseology and perhaps having apparent limitations, is substituted therefor,
238 the examiner might naturally assume that the applicant admitting the lack of patentable novelty in the erased claim asks for a patent for what is supposably a different matter, at least in scope. Under such circumstances, the examiner, because of the rejection and erasure of the original claim might look to the specification and drawings of the application for a more limited construction of the new claim than he would have given it had it been an original claim. In other words, the examiner himself, in considering a claim substituted for one rejected, and erased and having a different and perhaps apparently a more limited phraseology than the original claim, might apply to the new claim the same rule of construction which I have stated in answers to the questions of counsel; and he might thus allow a claim, on the theory that applicant had himself given it a construction, when he would not have allowed it in the first instance. In my judgment, if the applicant intends to secure the allowance of the same claim which he put in in the first place, he should either say so and stand by the claim, or in substituting another for it and changing its form and phraseology, he should be very careful to point out his intention. If he does not do this, he at least casts a grave doubt upon the examiner's understanding of the claims as allowed.

X Q. 39. Is not the filing of any claim whether by amendment or otherwise, notice that the applicant insists on his rights to what is embraced in that claim irrespective of whether it is accompanied by a letter or an oral argument or by neither?

A. It is of course notice that the applicant claims the right to a patent for the subject-matter set forth in the claim, the same being construed in accordance with all the conditions of the case. For instance, a claim of a patent which seems at first reading to mean one thing may evidently mean something very different in view of admissions in the specification. In the same way, a claim of a patent, appearing on its face to mean one thing may undoubtedly be greatly limited by the actions and admissions of the applicant in the course of the prosecution of his application, so that the claim may really mean something very different from that which its language seems to express. Nevertheless, the filing of such a claim, in either case, was exactly the kind of notice to which the present question was directed. I suppose it will not be questioned that an applicant, by the erasure of claims from his application, after the rejection of the claims for lack of patentable novelty may put a construction upon his remaining allowed claims, much narrower than that suggested by their terms; and this fact I should
239 say might very properly be taken into account by an examiner in passing certain claims to issue, other broad statements

of the invention having been rejected for alleged lack of novelty and erased by the applicant.

X Q. 40. You may understand that I do question most decidedly the proposition which you say you presume will not be questioned. If a claim is rejected upon a reference which upon examination you find does not meet the claim at all and you are satisfied that your client is entitled to, all that is embraced in it but at the same time it seems to you upon further examination of the claim that its phraseology can be improved without at all restricting its scope and that it is best to redraft it accordingly before arguing the question of your client's right to that subject-matter and you accordingly redraw the claim, and obtain its allowance, do you understand that you thereby concede that the subject-matter embraced as well in the original draft of the claim as in the amended form is old?

A. When a claim is rejected for alleged lack of patentable novelty and is erased by the applicant, the presumption, in my judgment, is that the applicant acquiesces in the examiner's position and strikes out the claim because of its lack of patentable novelty. If this implication is to be avoided, it must be done in some unmistakable way. This, as I have said, may be effected by statements outside the mere erasure and substitution of the claim. It may be done, as I have said in answer to a former question, by substituing a claim which unmistakably covers the same subject-matter set forth in the original claim and covers it without any added limitations, either substantial or apparent. The erasure of the original claim and the substitution of a different one therefor, clearly raises the inquiry as to the difference of any, between the original and substitute claims; and if differences appearing to limit the substitute claim in any degree are to be found in it, it may be assumed that these differences constitute the ground for the allowance of the claim by the examiner and that the patent was granted and the substitute claim allowed on a theory of the invention under which the original erased claim was not considered patentable by the examiner, or in effect by the applicant, since he has acquiesced in the requirement of the examiner.

Answer objected to as not responsive.

X Q. 41. Arguments before the examiner during the pendance of applications are frequently made orally instead of in writing, are they not?

A. They frequently are; but the best practice is to place on file in writing such reasons as shall afford a proper ground for the actions of the examiner and at the same time protect the applicant.

240 X Q. 42. It is quite common, is it not, particularly where the applicant is represented by a Washington solicitor, to have an oral interview with the examiner after the rejection of a claim and where he is persuaded that the subject-matter is in substance original with the applicant it often happens does it not that as a result of the discussion either the examiner or the solicitor suggests that while the reference does not meet the claim as it stands the claim would be more satisfactory if differently expressed and an

amendment is made in writing to correspond to such suggestion without either the examiner or the solicitor intending thereby to admit that the subject-matter embraced in the claim as it originally stood was old?

A. The practice in the office varies very greatly. Some examiners are very liberal in the matter of oral argument and explanation; and agreement is frequently reached by such examiners with the attorneys as to claims. In my own experience, the result of such interviews has generally been the agreement of the examiner to my position, or a total disagreement, or some supposed concession on my part, expressed by inserting some sort of limitation in the claim—the limitation sometimes being very important, and sometimes merely to suit the examiner. I had at one time a succession of applications in the division of the office under the charge of Examiner Stocking and I never knew him to allow an oral interview. He always said that whatever influenced him in the case must be in writing in the record.

X Q. 43. Do you mean to say that he never allowed an oral interview?

A. I mean to say that I never knew him to allow one.

Redirect examination by Mr. BANNING:

R. D. Q. 44. In your direct examination you referred to patents showing stationary hollow spindles. Since closing your direct examination have you examined any further into the art in reference to this particular matter? If so you may state briefly whatever you may have found.

A. I have been shown today some copies of patents on wire-barbing machines, some of which show stationary spindles bored longitudinally for the main wires, while others show the same spindles rotatable. Two patents which show stationary spindles are patent No. 277,451, issued May 15, 1883, to Frank W. Brainerd, and patent No. 357,653, issued February 15, 1887, to Albert J. Bates. Two other patents which show rotating spindles are patent No. 157,508, issued December 8, 1874, to Joseph F. Glidden, and Phineus W. Vaughan, and patent No. 233,331, issued December 11, 1880, to James Ayres and Alexander C. Decker.

241 Question and answer objected to as irrelevant and incompetent.

R. D. Q. 45. Please state whether or not the various patents that you have considered in your examination illustrating the prior art are, in your opinion, sufficiently full, explicit and plain in their illustrations and descriptions as to be understood by one skilled in the art and whether or not, in your opinion, they illustrate and describe practical and operative machines?

A. I should say from my examination of all the patents of the prior art, except perhaps the British provisional specification of 1876, that each of them shows a machine adapted to operate in accordance with the explanation in the specification. The British

patent of 1876 suggests and clearly outlines, in general terms, a construction not up to that time illustrated in the prior art; and the patent itself has no illustrative drawings. In my opinion, however, as I have said before, a mechanic skilled in the art and familiar with the Whitehead British patent of 1854 and the Nesmith U. S. patent of 1854, might have built a machine embodying the briefly described construction of the British patent of 1876, without the exercise of invention.

All the patents of the prior art are clear and easily comprehensible; and the description and illustration of each of them, with the exception of the British patent of 1876, is alone sufficient to give a full understanding of the machine of the patent.

By Mr. BANNING: Counsel for defendants offers in evidence the patents referred to by the witness in his redirect examination above, namely:

No. 157,508, December 8, 1874, J. F. Glidden, *et al.*
No. 235,331, December 14, 1880, J. Ayres *et al.*
No. 277,451, May 15, 1883, F. W. Brainerd.
No. 357,653, February 15, 1887, A. J. Bates.

Adjourned until Thursday morning, October 13, 1898, at 10 o'clock a. m. at the same place.

STATE OF ILLINOIS, } ss:
Cook County, }

I, Belle W. Barry, a notary public in and for the county of Cook and State of Illinois, do hereby certify that the foregoing depositions of Adam Cochrane and Robert H. Wiles were taken in behalf of the Kokomo Fence Machine Comany, *et al.*, by agreement of parties before me at rooms 1303-'12 Marquette building, Chicago, Illinois, on the 23d day of September and the 3d, 4th, 5th, 6th, 7th
242 and 8th days of October, 1898; that said witnesses were by me each duly sworn before the commencement of his testimony to tell the truth, the whole truth and nothing but the truth; that the testimony of said witnesses and each of them was written out by myself in their presence and afterwards signed by said witnesses, respectively, as and for their depositions respectively; that said parties were represented respectively by Thomas A. Banning, Esq., for the Kokomo Fence Machine Company *et al.*, and Robert H. Parkinson, Esq., for Alva L. Kitselman *et al.*; that said testimony was commenced at 10 o'clock, a. m. on the said 23d day of September, and continued from time to time as noted in said depositions and concluded on the 8th day of October, 1898; and I further certify that I am not connected by blood or marriage with either of said parties, nor interested directly or indirectly in the matter in controversy.

In witness whereof, I have hereunto set my hand and affixed my seal of office at Chicago, in said county, this 3d day of December, 1898.

BELLE W. BARRY,
Notary Public.

Circuit Court of the United States, District of Indiana.

ALVA L. KITSELMAN ET AL.
vs.
KOKOMO FENCE MACHINE CO. ET AL. } In Equity. No. 9574.

Stipulation.

It is hereby, at the request of defendants, stipulated and agreed that the Kitselman Canadian patent sued on in the suit of Risdon v. Cochrane, at St. Thomas, Ontario, referred to in the deposition of Adam Cochrane, was, as to its drawings, specifications and claims, substantially, not to say literally, a copy of the Kitselman patent No. 356,322, of January 18, 1887, sued on in this case, complainants, however, insisting that the facts so admitted are irrelevant and incompetent herein, and reserving all objections thereto.

Chicago, November 28, 1898.

R. H. PARKINSON,
Solicitor for Complainant-.
BANNING & BANNING,
Solicitors for Defendants.

243 United States Circuit Court, District of Indiana.

ALVA L. KITSELMAN and DAVIS M. KITSELMAN, Copartners as Kitselman Bros.,
vs.
KOKOMO FENCE MACHINE CO., JESSE H. SROFE, Henry Ward, John E. Frederick, Kittie Srofe, George W. Frederick, Joel Ward. } In Equity. No. 9574.

Evidence in rebuttal on behalf of complainants, taken before and by Charles L. Hine, notary public, acting as special examiner by agreement of parties, at the office of Robert H. Parkinson, Esq., 1543 Monadnock block, Chicago, Illinois, beginning on Wednesday, January 25, 1899, at 10 o'clock a. m.

Present: Robert H. Parkinson, Esq., on behalf of the complainants; Thomas A. Banning, Esq., on behalf of the defendants.

JAMES W. SEE, a witness produced on behalf of the complainants, being first duly sworn, deposes and says, in answer to interrogatories propounded by Mr. Parkinson, on behalf of the complainants, as follows:

Q. 1. Please state your name, age, residence and occupation.

A. James W. See; Hamilton, Ohio; 48 years; mechanical engineer.

Q. 2. What, if any, attention have you given, both scientifically and practically, to mechanical subjects; what, if any, experience have you had in examining and comparing mechanisms for the

purpose of determining their similarity or difference of construction and mode of operation, and what, if any, opportunities
244 have you had of becoming familiar with the class of mechanism used in the manufacture of wire fence and with the conditions which such machinery has to meet?

A. I have been continuously engaged in mechanical pursuits since 1865, first as an apprentice at the machinist trade, then as a journeyman workman, then as foreman, then as draftsman and designer and then, beginning in 1875, as professional engineer. In the latter capacity I have served a large clientage in advising upon machinery and mechanical processes, with a view to judging of fitness for market, adaptation to economical manufacture and suitability for the ends in view. My work has been essentially that of judgment based on comparison. I have contributed largely to the mechanical press, and some of this matter has been reprinted in book form and adopted as text books in technical institutions of learning.

Regarding the manufacture of wire fence, I would say that for quite a number of years I have had more or less contact with this art, advising with inventors and manufacturers of such machinery. I have also done something in the way of inventing myself in this particular line.

Q. 3. Have you examined the four patents here in suit, to wit, the Davisson, Kitselman, Conner and Pope, and do you understand the construction and operation of the mechanism described therein and made the subject of the claims thereof?

A. I have, and believe that I do.

Q. 4. Have you read the deposition of Wilds, taken in behalf of defendants herein, and examined the patents and other exhibits mentioned in that deposition?

A. I have.

Q. 5. Have you, or have you not, seen machines corresponding, individually, to Complainants' Exhibits Kitselman Machines Nos. 1, 2, and 3, and the Complainants' Exhibit Defendants' Machine, in operation in the manufacture of fence in the field? and do you understand the construction and operation of such machines?

A. I have and do.

Q. 6. I call your attention particularly to question and answer 4 in Mr. Wiles' deposition and to the particular claims of the several patents in suit therein mentioned, and ask you whether or not you understand the inventions which are the subjects of these
245 claims as Mr. Wiles therein represents them to be understood by him? If not, please state what you do understand to be the nature and effect of those inventions, giving your reasons for such opinions as you may express.

A. I do not understand the matter as Mr. Wiles appears to understand it, and I think the difference in opinion is to be traced largely to a fundamental error in which Mr. Wiles appears to have fallen. It seems that Mr. Wiles has not at all apprehended the grand advance in the art brought about by the chain of inventions represented by the four patents in suit. This chain of inventions has

opened up the possibility of a practical and satisfactory machine adapted for use in the field in building *in situ* a wire fence formed of a peculiar fabric and representing the ideal cheap, handsome, efficient home-made metallic fence. Without the inventions represented by the patents in suit this would have been impossible. Mr. Wiles appears to have quite overlooked this grander aspect of the matter and to have concerned his inquires almost entirely with the smaller incidents of the matter. And even in his views of the minor matters, Mr. Wiles has, I think, failed in his understanding of some of the mechanisms of the prior art, and also of the fabric which they were adapted to produce.

Mr. Wiles has, I think, failed to appreciate the distinctive differences in the fabrics for wire fences, and has confused the different fabrics and overlooked distinctive merits.

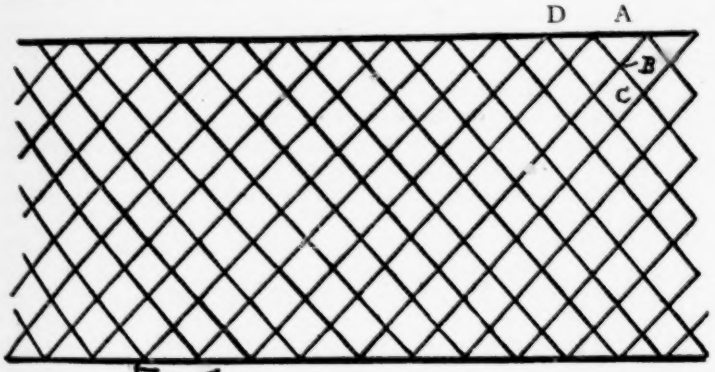

FIG. 1.

Fig. 1, above, represents a very ordinary old form of wire netting woven in the factory on power looms and then rolled up and
246 sold to farmers who employed it for fencing by stretching it up against fence posts and securing it thereto by wire staples driven into the posts. The top and bottom wires are heavier than the wires forming the diamond meshes, and it is these top and bottom wires that bear the longitudinal strains of the fence, and furnish its entire stability. The entire weight of the fence, considered as a suspended structure, is borne by the top wire. Such a fence has a fair amount of transverse strength only at its upper and lower edges, the main intermediate portion of the fabric being comparatively weak and incapable of resisting serious attacks by animals, and also much subject to buckling and bagging under the effect of weight and wind. No great stability can be expected from such a fence even with the posts set rather close together. And when it it considered that in many cases the fencing of land may cost more than the land itself, we are able to appreciate the high importance of economy in posts. We can readily appreciate the difference in economy found in a fence having its posts twenty feet apart as against one having its posts eight feet apart. And when it is con-

sidered that it is the duty of a fence to furnish resistance to attack and to natural causes tending to disorder or destroy it, we can appreciate the importance of economizing in the wire by getting the utmost of resistant capacity out of every ounce of it. In the fence above pictured, it is obvious that the top wire stands for the stability of the fence and that hence that wire must be very heavy if a good fence is desired.

The above sketch does not pretend to show the details of the weave, and it might at first glance be supposed that the diagonal wires ran continuously diagonally from the top to the bottom wire, merely crossing the intermediate wires. But that is not the case. The diagonal wires are not continuous, and they do not cross, but are twisted together. For instance, a diagonal wire traced from the point A is found twisted two or three times around the top wire and then going down to B where it is twisted two or three times around the wire coming up from C, the wire then going up again to the top wire around which it twists at D, and so on, the wire zigzagging up and down from the top wire to the intersections just below the top wire. And, similarly, wire C zigzags up and down to twisting
247 intersections with the wires above and below. The diagonal wires are thus seen to be formed of longitudinally extending wires deflected up and down to meet their neighbors, twistings being formed at the meeting points. This system of zigzags and twisting intersections applies to most all of the fence fabrics which it will become necessary to consider in the present controversy. Mr. Wiles has correctly understood this fabric, but he has failed to appreciate, or at least point out, its inherent weakness as a fabric for farm fences.

In recognition of the inherent weakness in fences formed of the above fabric it has, I understand, been the custom to sometimes reinforce the fence by stretching supplemental wires along it at various heights after it was erected, and fastening such supplemental wires to the posts. These supplemental wires gave increased transverse stability to the fence, but on their own account only, and they did not serve in supporting any of the weight of the fence or in stiffening the diamond fabric except in one direction, nothing preventing the wind or other agencies from pushing the diamond fabric away from these supplemental wires.

For the sake of a brief name, I will call the above fabric "Simple net fencing," and when I use this term the mind should go back to Fig. 1 and to a recollection of the inherent weaknesses of the fabric as a fence material.

An improvement has been suggested in this class of fences designed to somewhat compensate for the defects in the simple net fencing. This will be understood from Fig. 2.

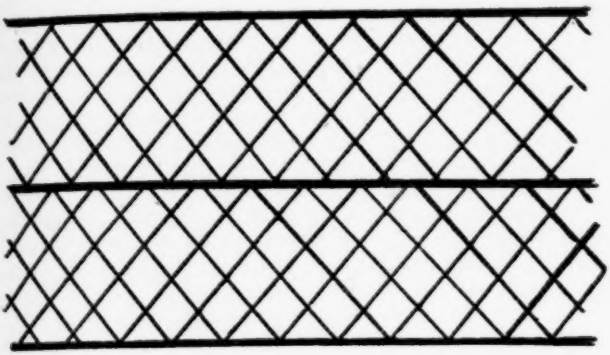

FIG. 2.

248 Notice in Fig. 2 that the upper portion of the fence is nothing but a piece of simple net fencing, with its top and bottom wires, and notice that the lower portion of the fence is also a piece of simple net fencing with its top and bottom wires, the bottom wire of the upper portion serving as the top wire for the lower portion. When such a fabric is properly nailed to the posts it will obviously have advantages due to an intermediate wire incorporated in the fabric itself. But notice that the diagonal wires are not twisted together at the intermediate wire, but that, on the other hand, the diamonds break joint at this wire and have no connection with each other and merely engage the longitudinal wire. Thus either portion of this fabric would be capable of slipping with relation to the other portion a distance represented by half the length of the diamond, and, also, there is a lack of continuity in the diagonal lines of strain where those lines cross the intermediate wire, the diagonal wires all being offset a half diamond in distance at said intermediate wire. Such fabric is in the market for fencing and is made on machines invented by a Mr. Sedgwick. As the fabric represents two parallel sections of simple net fencing, I will, for a brief name, call it "Sedgwick's twin netting." Mr. Wiles, in considering the Sedgwick machines, has failed to understand their manner of working and their product.

Recess until 1.30 o'clock p. m.

After recess.

Wire looms.

Fabrics like the simple net fencing and the Sedgwick twin netting above referred to was woven, if the process could be called weaving, in large stationary looms operated by power. The longitudinal wires forming the edges of the fabric, and also the intermediate wire, if there was such wire, would be led from stationary reels through the machine and then to a take-up cylinder or roll, these wires be-

ing strained and constituting the warp of the fabric. The wires of which the meshes were to be formed, constituting the woof
249 wires of the fabric, were then led from reels and through the machine and to the same take-up cylinder. The operation of the machine would result in the zigzagging and twisting of the woof wires so as to form a series of diamond meshes extending across the fabric, whereupon the take-up cylinder would be given a partial turn so as to reel up so much of the fabric as had been produced, after which the operation would be repeated, and so on and on, the completed fabric being rolled up on the take-up cylinder from which it was eventually removed for storage and shipment and use.

These looms were heavy and costly and complicated and took considerable power to run them and they were very bulky. But, being fixed factory machines, the weight and cost and bulk was not a serious consequence, nor was the complication, in view of the fact that the machines were used in factories under the eyes of skilled operators.

In all these old looms there was involved one feature of mechanism, essential in the principle of construction of the machines, which resulted in the complication. I may or may not be able to make the matter plain. I have reference to the manner in which the woof wires were led to the machine and dealt with therein. I will try and describe an elemental machine illustrating the principle of these old looms. Imagine three woof wires stretched from their reel to the roller on which the fabric is to be wound. Now, near the roller, deflect the middle wire sidewise to one of the side wires and twist these two wires together. Then move back a space and deflect it to the other side wire and intertwist it with that wire, and then back to the other wire, and so on, thus zigzagging the central wire and producing two series of half diamonds. Notice what happens in making the twists, regardless of how the twisting is done, and for the present we may assume that the twisting is done by hand, by means of a pair of plyers. Move the central wire over to a side wire and begin the twisting operation, that is to say, give the middle wire two or three turns around the side wire. This may be easy enough, and the twist may be satisfactorily produced, but it will at once become evident that there is trouble in the rear, for the wire between the twisting and the reels has become tangled up and twisted. Twisting is wanted just
250 where the twisting is being done, and nowhere else, but it is found that the result of the twisting is that the wire leading back to the reel partakes of the twisting action and gets into trouble. This has not prevented the proper twist from being made, but when that twist is completed and an attempt is made to carry the wire over to the other side wire it is found that the rear of the central wire has become twisted up with the first side wire and will not part company with it so as to be deflected to the second side wire. It becomes necessary to separate the rear wires by a reverse twisting operation. This rearward entanglement is so serious as to be fatal in making wire netting, and it became necessary to provide

machinery between the reels and the desired twisting points to guard against this rear twisting. In the assumed case of our elementary loom, let us assume that a man has deflected the central wire to the side wire and is making the desired twist. He finds the rear of his wire wrapping around the side wire, a wrapping which must be prevented. He sends another man to the reel which contains the central wire, and instructs him to pick up that reel and carry it round and round the side wire so that as the real twisting takes place there will be no twisting at the rear of that point. In short, the reel carrying the woof wire is given an orbital or revolving motion to compensate for and prevent its undesirable twisting at the rear. In the old loom for making wire netting there was arranged the twisting mechanism to produce the desired deflections of the wire and the desired twisting of the wires, this mechanism corresponding in function with the twisterman who has been referred to. The twisting mechanism involved a row of twisting devices, the series including as many twisters as corresponded with the number of diamonds forming the width of the fabric. This mechanism was arranged to deflect the wires and do the twisting, and might be called the twisting machine. Back beyond the twisting machine, and between the twisters and the reels from which the wire was drawn, was mechanism to give the woof wires and their reels the compensating orbital motion to prevent the rear twisting which I have referred to, such rear mechanism corresponding in function with the second man I have referred to. This rear mechanism, having no office in the twisting or in the formation of the fabric proper, and having only to see
251 that the wires are properly fed to the twisters without any rear entanglement, might be called the feeding mechanism. The loom thus essentially comprises a twisting mechanism and a feeding mechanism and, so far as I know, all the old looms for wire netting, which were capable of any practical success, were thus made. The double character of the mechanism involved essentially in these old looms was due to their fundamental principle of construction, due to the fact that the twisters were placed in front of the reels. Take any two parallel strings under strain and start to intertwist them at the middle by revolving both together, and you will notice the twisting takes place at the north and south of the point of attack by the fingers which do the twisting. In making wire netting it is the north twisting which is wanted, and the south twisting becomes mere fatal entanglement. Mr. Wiles appears to have quite overlooked this matter and to have failed to comprehend the fact that prior to the time of the patents in suit there were no netting looms for this wire fabric which did not involve this undesired rear twisting and the second mechanism or feeding mechanism for preventing it. It is this double system of machinery of feeding and twisting, which leads to the complexity and bulkiness of the old looms.

The first of the patents in suit, the Davisson patent, revolutionized the construction of netting looms, obviating the necessity for the rear feeding or twist-preventing mechanism by a system of con-

struction which entirely prevented the tendency to form these rear entangling twists. To put it in another way, Davisson avoided the rear entangling twists, and all the machinery usually employed to deal with those entangling twists, by the heroic expedient of not having any rear to his system. The troublesome twists in question took place between the twisters and the reels from which were fed the woof wires, that is to say, to the rear of the twisters. Davisson abandoned the rear of the system by transferring his reels bodily to the front of the mechanism which drove the twisters, thus putting the reels right on the fighting line and making them themselves take part in the real twisting work. Then, for the first time in the art, there was no troublesome rear, and no necessity for rear twist-preventing feeder mechanism. Davisson's radical de-
252 parture cut off the offending member, and improved and simplified the machine. Davisson's machine was a large factory loom, but his radical change in loom construction opened up entirely new possibilities in connection with the system of twisting.

Adjourned until tomorrow morning at 10 o'clock.

JANUARY 26, 1899—10 o'clock a. m.

Met pursuant to adjournment.
Present: Same as before.

The WITNESS (continuing): Davisson, in the first patent in suit, not only revolutionized the organization of the machinery in the manner I have referred to, but he also produced a machine capable of producing a distinctly novel and meritorious fence fabric in addition to the old fabric which I have spoken of as the simple net fencing. The new fabric which his machine was capable of making has warp wires running through all of the intersections of the diamonds, the wires of the diamonds at their intersections being intertwined with each other and around these warp wires.

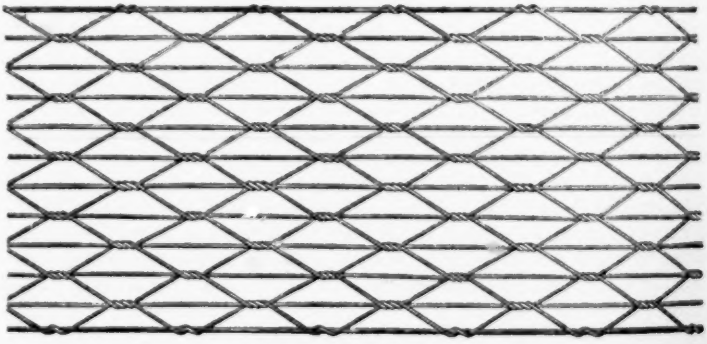

Fig. 3.

Fig. 3 illustrates this new fabric. Take out the intermediate warp wires and it would be simple net fencing having all the defects which

I have pointed out in connection with Fig. 1. Notice the
253 advantages of the new fabric as a fence. The stability of the fence is no longer founded exclusively upon the top wire, for that wire and wires below it can be broken or removed without interfering a particle with the stability of the fence, but only with its height. Again, all of the diamond work might become broken or removed and a fair sort of a fence would remain. Again, each of the diagonals formed by the woof wire runs practically continuous diagonally from the top to the bottom of the fence, there being no break-joints. Again, every single short-wire element in the system aids in reinforcing and bracing all its neighbors. Any single short element in the fence may be cut without affecting the general strength of the fabric, the break or cut having only the effect of producing a local hole in the fence. Again, this fabric, being so firmly bonded in all its units, has very superior vertical stiffness, and, as a whole, takes on a board-like characteristic of structure quite lacking in the simple net fencing.

Thus far it has been assumed that fence fabric, whether simple net fencing, or Sedgwick twin netting, or the improved fabric, call it Kitselman fencing, has been made in the factory on expensive, bulky, complicated power looms and rolled up and sold to the farmer to be stretched in the field and attached to posts. As thus viewed, the fabric was merely fencing material.

But the farmer has little money and often plenty of spare time, and it would be obviously advantageous if the farmer could have his own loom, but such looms are too costly and complicated for the farmer, and they require driving power and skilled operation. If a loom could be cheap and be operated by hand, and have not more complications than an apple-pearer, it would be useful. And if, in addition, the loom could be taken right out into the field to the fence line and there weave its fabric *in situ*, the advantages would be still more apparent. The product of such a field loom would not be material for a fence, but would be the fence itself.

The idea of the simple field loom is quite an old one, and many have been used, but they were quite incapable of weaving the fabric in question or any analogous fabric. They did not do all of the work, and they were only capable of producing picket fences, formed
of wooden pickets placed in position by hand and then bonded
254 by twisted strands of wire, the twisting of these wires, after the pickets were placed by hand, being the sole duty of the machine which I have called the field loom, a machine hardly entitled to that designation because it did not weave anything or of itself produce a fabric. But it is of importance at this time to understand these old machines, for they involve a simple wire-twisting operation which, being understood, will help in the understanding of the more complicated operation involved in the weaving of netting.

As a good example of such machines, I refer to Middaugh & Wilcox's patent, No. 309,724, calling particular attention to Fig. 2 of the drawing, which shows the machine at work in the field on the line of fence. B indicates a vertical frame standing on a foot

roller so it can travel along the fence line. H indicates a vertical series of rotary cylinders having cog wheels so that by turning the hand crank D all will revolve together. On the front end of each of these cylinders (see Fig. 7) is a cross-bar, K, having a pair of holes, L. Fig. 7 shows additional holes which may be ignored, being for alternative use. Two wires, together, are fastened to a fence post and led to a twisting cylinder, each wire of the pair going through a hole, L, in the twister, the pair of wires then being carried onward to the rear of the twister and fastened under tension. A pair of wires is similarly strung through each of the twisters, Fig. 2 showing a fence having four strands of wire. A picket is now placed vertically between the wires of all the pairs, the twisting machine being pushed up on the wires close to the picket. The twisters are now given two or three turns, thus twisting the wires of the pairs and confining the picket. At the time this twisting took place, the desired twisting, the wires at the rear of the twisters also became twisted and entangled. Here is an illustration of that rear twisting which was so fatal in netting looms and required machinery to take care of it, before the invention of Davisson. But in these picket-fence machines this rear twisting was harmless. As the operation has been thus far described, we have a picket in place and the retaining twists formed just in advance of it, and an entangling twist formed at the rear of the twisting machine. The machine is now moved somewhat away from the picket and a new picket inserted and the machine pushed up against the picket ready for the new twists. If an attempt were made
255 to make this new twist in the same direction as the old twist, then the entangling twist at the rear would be troublesome and would become fatal to continued operation of the machine. But this difficulty is all overcome by the simple expedient of making the new twist in the opposite direction, which results in untwisting the rear entangling twists and producing a new rear entangling twist of reverse direction. Thus each operation produces useful twists at the picket and produces a rear entangling twist, the alternate twists being in opposite directions so that the rear entangling twist is first produced and then undone. Between Figs. 5 and 6 of the drawing there is seen a picture of three pickets with the retaining wire twists. It is to be observed that the successive twists are in opposite directions. There is no objection to this in such type of fence. The type of fence is objectionable in that it contains wooden pickets cut into by the embracing wires and forming, above each wire, pockets which retain moisture and produce rotting of the pickets. Again, the wires tightly embrace the pickets and cut partially into them, and each swaying of the fence, continually occurring, causes a rubbing and cutting of the embracing wires upon the pickets, resulting in weakening them and in their ultimate destruction. The falling out of a picket slackens the entire panel of fencing. Furthermore, the fencing is expensive in cost and maintenance. Mr. Wiles, in referring to portable fence machines of this class, appears to have failed to appreciate the high advantages due to portable

field type of machines, or to appreciate the disadvantages of the only fabric they were capable of making.

Davisson, in the first patent in suit, greatly simplified and improved factory machines or fixed looms for making wire netting and he produced the first machine capable of producing the highly meritorious Kitselman fabric. Kitselman, in the second patent in suit, modified and adapted and rearranged the twisting system of Davisson so that for the first time in the art it became possible to build a fence *in situ* of wire-netting form and of the improved Kitselman form. In the absence of the Davisson invention, this could never have been accomplished in the absence of substitutive original invention or, in other words, in the substitutive origination
256 of the Davisson system. And it could not have been accomplished in the absence of the invention superposed by Kitselman upon the Davisson system. Mr. Wiles appears to have entirely overlooked these important aspects of the case.

Conner, and Pope, in the later patents in suit, still further modified and improved the Davisson-Kitselman system in the direction of increased capacity, certainty of operation, uniformity of product, and simplicity and substantiability of machine, the ultimate result of the chain of inventions being a very admirable field loom of low cost, great simplicity, highly efficient operation, capable of perfectly making the new fencing, and capable of yielding perfect product when operated by the unskilled labor of the farmer.

In connection with the picket-fence machines I have explained that as the desired twisting took place a rear entangling, twisting simultaneously occurred, but that this rear entangling twisting became untwisted at the subsequent operation. In connection with netting looms I have stated that this rear entangling system was fatal if it occurred, or, in other words, that twist-preventing mechanism was necessarily provided in the old looms to guard against such rear twists taking place. But I may not have been clear enough in explaining why these rear twists were permissible in one case and absolutely non-permissible in another case. In the picket-fence machines, the two wires of a pair are continually associated with each other, and with each other only. Those two wires go though their own twister and stay there. But, in the netting machines, of all kinds, a given pair of wires is twisted together and then each wire of that pair is removed from their twister and deflected sidewise into a neighboring twister and put into association with a new wire with which it is to be twisted. Therefore no mere reversal of twists will take care of the rear entanglements, for, before a new twist takes place, the rear wires concerned in that twist must not be entangled with wires with which they were previously associated.

In the old netting looms the twists were produced by twisting wheels provided with means for transferring the wires
257 from twister to twister after each operation; the wires proceeded through the twisters rearwardly to their reels; in the absence of rear twist-preventing mechanism the rear wires would become fatally entangled at each twisting operation, or, stated otherwise, there could not be a second twisting operation; special ma-

chinery was therefore provided to give orbital motion to the reels to prevent the fatal rear twists while the twisters were producing the functional twists desired; such construction doubled the machines in function, necessitating a mechanism to do the twisting and a mechanism to feed the wires in such manner as to prevent the rear twisting; the machines were thus essentially bulky, complicated and expensive; the machines could not produce the improved Kitselman fencing.

Davisson, in the first patent in suit, abandoned the troublesome rear portion of netting looms and mounting his reels right at the twisting point, causing them themselves to perform the twisting operation. He, for the first time in the art, placed his reels for the woof wire in this new position. The exigencies of the netting weave required the transfer of wires as they had been before transferred, but in his case he was confronted with the peculiar conditions of woof reels disposed right in the twisting zone, the transfer of the woof wires after each twist thus requiring the bodily transfer of the reels themselves. He accomplished this by providing his twisting spindles with cross-heads or cross-members bearing the woof reels as forwardly projecting members and arranged to transfer his reels from the cross-head of one spindle transversely to the cross-heads of neighboring spindles. In order to bring the cross-heads into line so that the transverse transfer might be effected, he moved his spindles and cross-heads and woof reels endwise after each twist. This was quite permissible in a fixed factory loom, but was not permissible in the compact structure requisite in a field machine. He made his twisting spindles hollow so that all of the intertwists of the diamonds could take place around intermediate warp wires whereby all of the units of the fabric became bonded together.

Kitselman, in the second patent in suit, recognizes the radical merit of the Davisson system of weaving wire netting, and
258 recognizes the apparent inconsistency of that system with any idea of realizing that system in a portable field machine without the exercise of original invention. He adopts the frontal reel and twisting system of Davisson; he adopts Davisson's hollow spindles and cross-heads and shifting reels. But he abandons Davisson's longitudinally moving spindles and cross-heads and reels and arranges for effecting the transfers by transverse movements only, thus realizing the Davisson system of weaving in a structure whose complexity and bulk were within the limits imposed by field-loom conditions. He realized and pointed out the capacity of the improved machine for producing in the field, not only the old simple wire netting of previous loom construction, but also the highly improved Kitselman fencing. In his machine the transfers after each twisting were effected by the manipulation of a special hand lever.

Conner, in the third patent in suit, dealing with a fixed factory loom, adopts the frontal twisting system of Davisson, along with his hollow spindles and cross-heads; and he adopts the transverse transfer system of Kitselman, thus avoiding the longitudinal motions of Davisson. To this combined Davisson-Kitselman system he adds an automatic transfer system whereby, instead of having to

operate a hand lever after each twist, as in Kitselman, the proper transfers are effected automatically. While his machine was a fixed loom, it was of exceedingly compact and simple form, well lending itself, by mere omission mainly, to adaptation as a field machine, though his patent does not mention this matter. But his patent does well disclose the application of the automatic transfer system to a machine founded on the Davisson-Kitselman system of twisting machinery.

Kitselman and Conner retained the rotary spindles of Davisson with the warp wires passing through their hollow centers. Such spindles, being rotary, require more or less careful workmanship and mounting, and, being rotary, their outer active ends are liable to move in orbits if the spindles are not accurately made or mounted firmly in their bearings of rotation. Furthermore, such spindles, turning on the warp wires which pass through them, may tend to rub and chafe those wires under the strain produced by the
259 twisting operations, a matter worthy of some consideration in connection with the thinly coated galvanized wires usually employed for fencing. Pope, in the fourth patent in suit, adopts the frontal twisting system and hollow spindles and crossheads and general transfer system of Davisson; he adopts the exclusively transverse transfer system of Kitselman; he adopts Kitselman's scheme of bringing the forward end of the spindles well forwardly in the zone of twisting, Kitselman having improved over Davisson in that respect; but Pope mounts the spindles stationary so that they have no motion whatever, the spindles thus furnishing fixed supports for twister mechanism and permitting of the frontal twister system of Davisson being realized in an outreaching system of reel support founded on a single bearing at the rear. The spindles, being non-rotary, also avoid any damaging turning upon the wires which pass through them. This construction simplified and cheapened the machine and improved its stability, improved the accessibility of the woof reels, and improved the general facilities for setting and operating the machine.

Recess until 1.45 p. m.

After recess.

Q. 7. Referring now specifically to the exhibits mentioned in Mr. Wilson's deposition as representing the prior art, do you, or do you not, find in any of these exhibits the improvements or inventions to which you have referred as represented by the several patents in suit, or any such approach thereto as would, in your opinion, materially limit or qualify the inventions exhibited in the patents in suit and recited in the second and third claims of the Davisson patent, the first, second, ninth, tenth, eleventh, fifteenth and twentieth claims of the Kitselman patent, the second and third claims of the Connor patent and the first, ninth and tenth claims of the Pope patent? In answering this question, please give your reasons for such opinions as you express.

A. I certainly do not. I do not find exhibits prior to the patents

in suit adapted even to the making of the Kitselman fencing, or adapted to the making of netting on the Davisson system of twisting; or adapted at all to the weaving of netting fences *in situ*.

260 First, as to the fabric itself, the Kitselman fencing illustrated in Fig. 3 of my previous answer. This fabric first appears in the Kitselman patent, being shown as a fence in Fig. 11 of his drawings, and being shown in Fig. 10 as being woven in a portable fence machine. The warp wires are arranged in number equal to the intersections of the diamonds, considering the series vertically; these warp wires pass through the hollow spindles of the twisters; a twister carries its pair of woof reels several times about its warp wire, thus intertwisting these two wires and twisting them about the warp wire; the two woof reels in question then transfer in opposite directions to contiguous twisting spindles, which simultaneously receive woof reels coming from other spindles above and below, the transferred wires first mentioned now becoming intertwisted with other woof wires and about upper and lower warp wires. No exhibit previous to the Davisson patent discloses a machine having the capacity for making such fabric, or discloses the fabric itself. The fabric cannot be woven on machines not capable of carrying the woof wires about each other and about warp wires passing through the axis of the twisting spindles. The only prior patents referred to by Mr. Wiles as of interest in connection with the special fabric in question are Whitehead's British patent 1285 of 1854; Smith's British patent 2516 of 1876; Nesmith's patent 10,143; and Sedgwick's patents 218,323 and 233,033.

Whitehead's British patent 1285 of 1854 is not only incapable of making the special fabric in question, but is incapable of making any fabric at all. It is an inoperative machine, purporting to be capable of weaving simple wire netting without any edge wires forming warps, but it involves several mechanical blunders of that fatal character into which pseudo-inventors will sometimes fall in patenting a machine before the controlling ideas had been thought out to their logical conclusion. I believe that it has been explained by witnesses in the *prima facia* and defense cases how wire netting is woven by means of split gears forming the twisters, each half of the split gears having a hole for one of the woof wires, and the half gear being alternately shifted, first into association with a neighboring half gear at one side and then into association with a half gear at the other side. In plate 4 of the drawings

261 of Whitehead's patent there is the best illustration of this general split-gear system. Consider one of the twisting gears, say the second one from the right, the two halves being lettered H and *h*, respectively. There is a hole in each half, and a woof wire through each hole. Turn this gear and these two wires will be twisted together properly. The twist having been completed, bring the splits into line and slide the lower half gears to the right and the upper half gears to the left. This brings half gear H into association with half gear 1, and brings half gear *h* into association with half gear G, as seen in plate 5. Now repeat the twisting operation

and everything will be satisfactory, providing there is no mechanism to the rear of the twisters to take care of the rear twists, for these twisters insist on producing twists at their rear as well as at their front. This matter will be considered later. There are no warp wires and there can be none, nor can there be border wires. There are no central holes in these twisting gears for warp wires, and if there were warp wires in such holes then the shifting of the half gears would not be permissible and the only effect of an attempt to shift the half gear would be to block the shifting in an attempt to bodily split the warp wires. The machine was never intended to and is not adapted to the production of fabric having warp wires, and could not be modified into a machine having such capacity. Mr. Wiles appears to have fallen into the error of believing that this machine could be modified in view of teachings found in Nesmith's patent 10,143, and Smith's British patent 2516 of 1876 so as to produce the fabric in question. These two patents do not teach that fabric or any manner or mechanism for making it, and, skipping those patents entirely and going right into the modern art as represented by the patents in suit, we find that the very scheme of construction of this Whitehead patent is prohibitive of having superposed upon it the teachings of that modern art so as to bring about the production of the new fabric. Wherever the teaching of hollow spindles and warp wires in those spindles may be found, such hollow spindles containing warp wires are totally inadmissible in the Whitehead machine, for they will positively prevent the shifting of the half gears. The Whitehead system of machine does not
262 disclose the improved fabric or its manner of making or any machine capable of making it or of being modified so as to be capable of making it. The exhibit is quite without interest in connection with Kitselman fencing further than as illustrating a machine capable of making it.

But I have stated that this Whitehead machine, or rather idea of a machine, was inoperative for any useful purpose and, while it is apart from the question of the new fabric, I may explain this point here. Before this machine can weave any fabric it must be capable of transferring its half gears. Such is the intention, and means have been provided intended for the purpose, but the means are blundering and quite inadequate and are self-defeating. Turning again to plate 4, F is a rack gearing with all of the twister gears and designed, when reciprocated, to give the gears their rotary motions for the production of the twists. The half gears have their split hubs bearing in half journals formed in the contiguous faces of two slidable bars, B^2, better illustrated in plate 2, Fig. 1. As seen in plate 4, these half gears are in one proper association for twisting, or after twisting and are ready to be shifted. The shifting is designed to be accomplished by sliding one half bar B^2 to the left and the other to the right, which sliding motion is effected by turning pinion X, which gears with both of the sliding bars. Under ordinary circumstances this provision would be adequate and satisfactory for shifting the half gears to their new associations. But, unfortunately, this brilliant inventor has forgotten something. Notice in

plate 4 that all of the twister gears of the lower series engage with the operating rack F. This rack is stationary at the time the shifting is to take place, and it forbids the shifting. Move the lower sliding bar B^2 to the right, or try to, and see what happens. Center the eye on half gear K. L. Attempt to carry it to the right and the inevitable result is that its engagement with rack F causes the gear to turn or attempt to turn. The splits between the half gears have been brought into line, and they must stay in line if shifting is to be done. As soon as shifting is attempted then the half gears begin to turn and get out of line so that the half hubs cannot slide, the result being an instant locking of the sliding half bars B^2 as soon as they begin to perform their function. Assuming that the defects in question were capable of being remedied by the exercise of
263 invention, and I fancy it would take considerable to do it, it is evident that the affair is presented to us in half-baked condition and that it is quite inoperative.

I have also referred to the necessity for taking care of the rear twists in any machine of this class. The exhibit makes an attempt in this direction by providing rear twist-preventing mechanism, but here again the inventor has involved himself in fatal blunders. Turning to plate 1, we see near the top of the machine the twisting gears and the sliding bars B^2, the twisting being done at a point above these parts, and the fabric going to the take-up roll H. Down below the twisters, and representing the rear region, is the mechanism designed to take care of the rear twists. At the foot of the machine is a second series of split wheels similar to the first ones, and similarly mounted in sliding half bars for their transportation. Long spindles E are mounted eccentrically in the split gears and extend from the upper to the lower gears. On these spindles the woof wire is wound, the idea being that as the half gears carry these woof spindles around in orbit, the rear twisting will be prevented. This might be all right if these woof spindles could only turn on their own axes so that the woof wires could feed from them to the twisters. But for some inexplicable reason this inventor has stupidly locked these woof spindles against rotation, thus again totally defeating any useful operation of the machine. In plate 2, Fig. 3, shows one of the lower split gears, hardly a gear, however, because it has no teeth. Notice the little square mortises at A and B. These mortises are to receive the feet of the woof spindles and prevent their turning on their own axes as they are carried about by the half gears. Fig. 2 A shows the under surface of one of the upper split twister gears. C and D are round holes for the reception of the upper ends of the woof spindles. There is some sense in these round holes, something consistent with the proper and essential rotation of the woof spindles on their own axes so that they will deliver up wire to the twisters. But this inventor has deliberately gone to work again at this point to prevent the proper rotation. Notice the channels X crossing the round holes C and D. Fig. 4 shows one of the woof spindles with the wire wrapped on it, and capable of unwrap-
264 ping from it only by the rotation of the spindle on its own axis. The end at the right is carefully arranged to be held

against rotation in the square mortises seen in Fig. 3, and the end at the left, going into a round hole C or D, is seen to be provided with a little cross-pin to go in the channels X so as to lock the upper end against rotation. Notice in Fig. 4 that the lower end of the spindle has a shoe B clamped to it by the set-screw *b*, the lower end of the shoe having a square tennon to fit in the square hole A or B of Fig. 3. The specification states:

"Plate 2, Fig. 4, represents a spindle. *a* is a square tennon, which fits into the shoe B, and is fastened by the set-screw *b*. This shoe 1 B fits into the hole B of the wheel C (Fig. 3, plate 2), the hole A being occupied in a like manner with the shoe of another spindle. The top of the spindle has a cross-pin which fits into a slot in the bottom of the wheels D, D, D, plate 1, as shown in Fig. 2*a*, plate 2, which represents one of the wheels D, D upside down. This cross-pin is simply to make the spindle turn with the wheel D, plate 1."

This is all wrong, and fatally wrong. The spindles will be carried around in orbits by the split gears, but under no circumstances can they perform the necessary motion of rotation on their own axes. The specification later states: "When the wires are thus secured the wheels D, D, C, C and the spindles E, E are made to revolve on their own axes by turning the handle K." The turning will take place on the axes of the wheels D, D and C, C and the spindles will revolve or move in an orbit about the axes of those wheels, but under no circumstances can the spindles make the necessary rotations upon their own individual axes. The entire affair is quite inoperative and the exhibit is of main interest as illustrating, first, what we may call the split-gear system, and, second, as illustrating what half-baked construction will sometimes be found in premature patents. This is about the kind of a construction which we might expect to find set forth in an American caveat, a preliminary sort of a document provided for in our patent laws, a document in which the inventor foreshadows the lines on which he is working and states the necessity for further
265 maturing the idea, the object of the caveat being to give him notice, if somebody else, having struck on the same idea, succeeds in getting it into patentable shape before he, the caveator, files his application. By the British system of procedure, with which my experience as a solicitor has made me familiar, an inventor may take a preliminary step by filing a provisional specification. This has a six months' term and the inventor may follow it up, if he can, by filing a complete specification and getting a patent under the great seal. Many inventions are abandoned after the provisional step. The Whitehead British patent now in question is provisional only, the heading showing that "This invention did not proceed to the great seal," and well it may not have proceeded to the great seal.

Another British patent referred to by Mr. Wiles in connection with the Kitselman fencing is Smith's patent No. 2516 of 1876. This patent is a mere jumble of vague ideas and possible hopes without any information of any avail whatever in the art. The inventor evidently wanted to accomplish something and did not know how he was going to do it, and suggests two or three possibilities. He

obviously wants a stronger fence than results from simple wire netting, and he proposes to secure this additional strength by means of longitudinal wires worked in some manner into the meshes. But there is no telling what kind of netting he proposes to have to start on, whether square netting or diamond netting or octagon netting or what-not. He proposes that the strengthening wires shall be "either single wires or compound, or cable wires." There is no telling what sort of a product might or might not result from this. He states that these wires "are secured by being surrounded and gripped by every twist of the mesh. They may be applied through all the meshes or through alternate meshes." This sounds well, but we have no means of understanding anything about the fundamental fabric with which these extra wires are to be combined so as to know how they are to be surrounded and gripped by every twist of the mesh. We do not know what twists the mesh has or where they are located with reference to each other. That is all the description we have of the proposed fabric. He does not show or describe
266 a machine for making the fabric or for making any other fabric. He evidently has reference to old machines of the split-gear type and, perhaps, of the upper and lower story system of the Whitehead patent just considered. He states:

"I apply to the lower part of the machine, feeding bobbins, supplied with the wires or cables, which pass up to the work in suitable guides, and I cut a space out of the center of one of the halves of the twisting wheels (which are always made in two parts) so that my wires shall pass through; then, when the divisions of the wheels are carried apart by the ordinary sliding bars, my wires are pushed by guides out of the spaces in the wheels into the slots in one of the sliding bars, about midway between the turning wheels and on the opposite side of its half wheel, so that my wire may be held while the twist is made, and they are thus relieved from the action of the twisting wires which form the mesh."

I defy any mechanic to make head or tail out of this matter. It can be judged that there are split twisting wheels, and reels to the rear of them, or below them. But all that is said about "suitable guides" and "spaces" and "slots" and "pushing guides" becomes simple or complex Greek, according as you view those terms. I know of nothing in the then current art to which these vague suggestions are capable of any practical application. There may have been in the mind of this inventor some well-known British machine which, being understood, made his suggestions comprehensible, but there is no such machine disclosed in the present record, and I have knowledge of none. The suggestions will not fit themselves to anything we have.

The suggestions may, or may not, have had merit. None appears. But even these suggestions seem tentative, for a substitute suggestion is made as follows:

"Or I divide the twisting wheels into three parts, my extra wire passing through the central division, and the two segments travel to and fro to form the twists, leaving the central division in position with my supplementary wire therein maintained."

267 This is more Greek, for it cannot be told if it is proposed to employ the same machine as referred to in the first suggestion having twisting wheels with feeding bobbins to the rear of or below them, or some other kind of a machine. It is impossible to tell what kind of twisting device he has in mind to form the twists by traveling to and fro of side segments. The two quotations I ha ve made cover all there is of interest in this patent, and the more we study it the more we are in the dark as to what the inventor proposed to do and how he proposed to do it or what he proposed to do it with. We are left quite in the dark as to the nature of the fundamental fabric on which he proposes to improve as well as the nature of that fabric after it has been improved. And we know of no machines in the then current art to which the suggestions would be at all applicable. Mr. Wiles has attempted to read this specification in view, not of the current art, but in view of the modern art as disclosed by the patents in suit, but does not appear to have reached any satisfactory understanding of what the patent is about except that it relates to fence netting which is to be strengthened by longitudinal wires. He allies it with Whitehead's British patent. This may be correct, but the alliance is in nowise helpful or creditable, for the Whitehead machine is inoperative in itself and quite useless, and Smith's suggestions do not touch the vital defects of Whitehead nor would they be applicable to Whitehead. It seems to me that Mr. Wiles should have devised and shown us drawings of some machine of the old art modified in accordance with the suggestions of this British patent of Smith's. It might have been very interesting. I have studied the patent carefully and I look upon it as utterly lacking in any useful suggestion as to the well-recognized fact that fence netting without longitudinal wires is undesirably weak and that such reinforcing wires, if they could be properly placed, would add very much to the strength of the fence. The exhibit did not advance the art a particle. This, again, was one of the British provisional patents which died aged six months. It never went to the great seal, the official heading explaining that "This invention received provisional protection only." It might be likened to the American caveat disclosing what the inventor hoped in time to accomplish.

268 Another patent referred to by Mr. Wiles as disclosing a machine capable of making Kitselman fencing is Nesmith's patent No. 10143. Something will be said about this patent later on when mechanically considered, but at present the peculiar Kitselman fabric only is under consideration. Regarding the mechanism of the Nesmith patent, it is sufficient at this point to say that it was intended to weave simple netting; that it produced the twists properly, so far as they were concerned, by means of a series of twister gears having radical slots engaging the wires; that the wires, in being transferred, were shifted out of the slots of one twisting wheel and into the slots of the neighboring twisting wheel, slotted twisting gears here taking the place of the split twisting gears heretofore referred to; that the reels carrying the woof wires were to the rear of the twisters; that the usual fatal rear twists would naturally

be produced and must be taken care of if the machine was to be operative; and that this rear-twist difficulty was attacked by placing to the rear of the twisting machine a second machine of equal bulk and greater complexity to carry the wires parallel, as it is expressed, to avoid the rear entanglement which would be fatal to the operation of the twisters. The twist-preventing rear mechanism is of doubtful character and appears quite complicated, but of that hereafter. The netting was to be provided with the usual two border wires, corresponding with the top and bottom of the fence. These two wires very properly went through the spindles of the outside twisters. The intermediate twisters had solid spindles, thus absolutely preventing the presence of intermediate warp wires for any purpose whatever. Mr. Wiles does not expressly say that this Nesmith patent distinctly sets forth a machine which could receive intermediate warp wires, but he thinks there is an implication in the description justifying the possibility of the intermediate spindles being hollow so that warp wires could be passed through them. I am quite satisfied that Mr. Wiles is wrong on this point. The Nesmith patent drawings represent a series composed of five twisters, the outer ones only being described as hollow for the passage of the border wires. The length of this series of twisters represents the maximum capacity of the machine in width of fabric, such fabric having a border wire at each edge. A fabric may be
269 wanted less in width, and the inventor provides for it by suggestion in his specification, but he does not provide for such narrowed fabric having two border wires, and he does contemplate a fabric in some cases having no border wires whatever. It is in the suggestion regarding the narrowed fabric that Mr. Wiles thinks he detects the implication of passages through the intermediate spindles as well as the border spindles. The language of the suggestion in the specification is as follows:

"It is necessary to have machines for making every different size of the netting or fence, that is, for every different size of the meshes of the same, and any width of the netting less than the whole scope of the machine can be made by simply drawing in the number of wires desired, as will be understood hereinafter."

But nothing is said on the subject "hereinafter," notwithstanding the promise. Mr. Wiles' idea seems to be that the machine obviously makes a fabric of full width with a border wire at each edge, and obviously contemplates a narrower fabric, leading to the presumption that such narrower fabric would also have a border wire at each edge which, notwithstanding the teachings of the specification that only the two outside twisters are drilled for the passage of warp wires, would necessitate passages through the intermediate twisters also. Mr. Wiles' error lies, first, in failing to understand that these net fabrics, produced by this type of twisters, can run their woof wires as practically straight border wires, and that such fabrics are made sometimes without any special border wire at all, such, for instance, being the contemplation of the Whitehead British patent; and that Nesmith contemplates his machine without any provision whatever for special border wire. The specification, in

providing for the special border wires, states that they are passed through holes drilled in "the two outside twisting gears." To produce a narrower fabric it is only necessary to abandon one margin by not threading up unneeded wires, and the new outside woof wire will form a straight margin, but not a special strong untwisted border wire. And such could be done at both edges of the
270 fabric if desired. The machine is designed to produce a full width of fabric with two border wires or a lesser width with one border wire only, or a full or lesser width with no border wires. The fact that special border wires can be employed at both edges of the wide fabric or at any one edge of the narrower fabric is due to the fact that the outside twisters are provided with passages for the border wires. But the inventor contemplates dispensing with these border wires and with the passages which permit of them, for in his sixth claim he claims "The feeding and twisting gears, with or *without* their centers perforated to admit the border or warp wires passing through them." Without these perforations there could be no border wires at all, but there would still be a netted fabric with selvages formed by undeflected marginal woof wires.

Not only is there no contemplation of passages through the intermediate twisters, but there is construction shown which positively precludes the passage of warp wires through such passages if they existed. In the Nesmith machine, after each twist, the woof wires are, as before explained, shifted from the slots in one twister gear to slots in another twister gear, and this shifting is effected by forcing wedges down between the wires in a given twister so as to force the wires apart and over into the slots of contiguous twisters. These shifting wedges, in performing their duty, pass right over the centers of the twisters and prevent the presence of any intermediate warp wires. In Nesmith's drawings, Fig. 4 may be referred to as showing the wedges S which have gone up to press the wires into the center and outside twisters J. It is to be noticed that the bodies of these wedges completely cover the intermediate twisters, the wedges thus being inconsistent with the presence of warp wires, and the presence of warp wires preventing normal movement and operation of the wedges. Mr. Wiles has produced a model of the feeding end only of the Nesmith machine, as he understands that machine, but he has provided all of the twisters, so he calls them, with central passages, and has vertically slotted one of the wedges at the central gear to permit of a warp wire at the center of the fabric. This perforating of the intermediate gear and slotted of the wedge is quite without warrant
271 from the Nesmith patent. Furthermore, the model produced by Mr. Wiles is not the twisting machine of the Nesmith at all, or any part of the Nesmith machine designed for the production of fabric, but, on the other hand, is merely the rear portion of Nesmith's double machine designed to feed the wire in a parallel manner to avoid the fatal rear entanglement. Nesmith refers to one division of his machine as the "twister," and he refers to the rear division as the "feeder." Mr. Wiles has produced only the feeder, and has treated it as a twisting machine for the production of netting and

founded on the Nesmith patent. This is entirely wrong and quite unwarranted by the patent.

I here produce a model of the Nesmith machine, the same being an officially certified copy of all that is left since the fire in the Patent Office in 1877. I suggest that it be marked "Nesmith Certified Model." Parts are gone, but the main parts are present and in correspondence with the drawings and description in the patent. It is to be observed that the machine is of dual character, one division is the feeder and the other is the twister. On the baseboard at the proper end I have marked "twister end." Let it be noticed that only the outside gears of the series are perforated for the passage of warp wires, and notice that the wedges, those that are present, are not slotted or cut away except to provide for warp wires through the outer gears.

The Nesmith patent does not contemplate the production of Kitselman fencing or disclose mechanism adapted for the production of such fabric; the model produced by Mr. Wiles is the feeder and not the twister of Nesmith; its modifications to permit the passage of intermediate warp wires is quite unwarranted by the patent; and the implication on which Mr. Wiles has grounded his belief in the possibility of intermediate warp wires is an implication not found in the Nesmith patent. The model produced by Mr. Wiles contains other unwarranted modifications which will be considered later apart from the mere question of fabric now under discussion.

Adjourned to tomorrow morning at 10 o'clock.

272 JANUARY 27, 1899—10 o'clock a. m.

Met pursuant to adjournment.

Present: Same as before.

The WITNESS (continuing): It only remains to inquire into the Sedgwick patents, No. 218,322 and No. 233,033. As the two patents are alike, so far as present interest is concerned, the second one expressly relating to specific improvements upon the mechanical details for accomplishing the same results in substantially the same manner, I will confine my attention, for the present, to the first patent. Mr. Wiles expresses the opinion that the Sedgwick patents set forth machines analogous to the machine of the patent in suit in stated *of* particulars, and that the machines are capable of and designed for and stated as being capable of carrying warp wires through the intertwists of the diamond meshes of the netting. Mr. Wiles is quite at sea in this matter, and has failed to apprehend the working of Sedgwick's loom. It is capable of making fabric like the Sedgwick twin netting to which I have before referred, consisting of what might be described as parallel fabrics joining each other on a common warp wire on which the marginal diamonds of the individual fabric break joint, there being no unity between the several fabrics except that their edges take hold of a common wire. The machines are quite incapable of making the Kitselman fencing.

I have heretofore explained that in all the netting machines prior to Davisson the woof wires came from rear wheels forward to the

twisters which produced the fabric, the twisting operation tending to rearward entanglement of the woof wires and essentially requiring the presence of rear mechanism to take care of these entangling rear twists, the machines thus taking on the dual aspect of a twisting machine to make the fabric, and a feeding machine in the rear to supply the woof wires and take care of, or rather prevent the rear entanglement of those wires. The Nesmith patent and its certified model indicate these general conditions, it being observed that the feeding machine is as impressive as the twisting machine. The Sedgwick machine belongs to this same general class of dual machines, Sedgwick's machine being, however, arranged vertical, instead of horizontal, as in the case of Nesmith. Sedgwick's
273 machine comprises two machines, a machine of the slotted-gear type for doing the twisting and producing the fabric, and a rear machine of much greater complexity and impressiveness for feeding the woof wires and preventing their rear entanglement.

Referring to Fig. 1 of Sedgwick's patent 218,323, the twisting and weaving is done at the general level indicated by H^4. At this level are arranged the slotted gears, shifters, etc., illustrated in Fig. 8. The completed fabric goes on up to take-up rolls. The wires fed to the twisters come up from the lower story of the machine, or from the complex mechanism for taking care of the rear twists. This complicated mechanism is seen at the base of Fig. 1 where D, D, D, D represent reels for carrying four of the woof wires, these reels traveling in an orbit. Turning to Fig. 3, the arrangement may be better understood. In this Sedgwick machine the twisters twist both of the woof wires, and the feeding machine takes care of the rear twists by carrying one of the woof wires around the other woof wire in correspondence with the twisting motion, thus avoiding rear entanglement of the two woof wires. In Fig. 3 G^1 indicates stationary reels supplying half of the woof wires, these wires passing horizontally inward and then turning at right angles at sheaves g^2 and then passing upward to the twisters, these vertical wires being also indicated by G^1. The lower portions of these vertically fed woof wires have no horizontal movement, but remain constantly at their points of departure from the periphery of fixed sheaves, g^2. The upper ends of these wires travel in a circle or orbit as imposed by the motion of the twisting gears which carry these wires in their slots. During the twisting operation these vertical woof wires, G^1, therefore have motions like an inverted conical pendulum whose pivots are at the sheave g^2 and whose maximum orbits are at the twister gears. These wires represent half of the woof wires.

If, now, the remaining woof wires were fed to the twisters in a similar manner, the twisters would, in producing their frontal functional twists, also produce rear twists which would prohibit the subsequent transposition of the woof wires into new couples. The remaining woof wires must therefore be so fed as to avoid this rear twisting, and this is accomplished by feeding these remain-
274 ing wires from reels given orbital motion in correspondence with the motion of the twisters, these reels being transferred

to new positions to form new couples of woof wires after each twist. In Fig. 3 D^2 indicates the reels for these remaining woof wires, D^2 also representing the wires passing vertically from them up to the twisters. As the twisters move the tops of the two wires of a pair around in a common orbit to produce the functional twists, the appropriate mechanism of the feeding machine carries the reel D^2 pertaining to the pair of wires in question, in an orbit around the fellow-wire G^1. By this means no rear twisting occurs. It would be sufficient if reel G^2 was carried around its fellow-wire in a circular orbit, but Sedgwick substitutes a rectangular orbit for the circular one, the same twist-preventing result being accomplished, and in the same way, but the square orbit better lending itself to Sedgwick's very peculiar system for transferring the reels D^2. Let it therefore be understood that Sedgwick carries his reels D^2 around the wire G^1 in an orbit having the office and effect of a circular orbit in preventing rear twists, but that he makes this orbit a rectangular one involving a north, south, east and west motion of the reels. As thus far considered, the Sedgwick machine, comprising the twisting machine and the twist-preventing feeding machine, would produce simple net fencing without special border wires. If operated without special border wires the selvage of the fabric would be formed by the outer woof wires running straight along the edge, or comparatively straight, and intertwisted at the extremities of the marginal half diamond of the mesh. This would be ordinary diamond netting without special margin wires. But the twisters all have openings through their centers. If the outer woof wires be passed through the centers of the outer twisters, instead of through the slots thereof, then the selvage would be formed as before, but without intertwisting at the marginal wires, the outer-diamond wires being merely twisted around the straight selvage wires. Extra heavy wires will generally be employed for these selvage wires, thus constituting the extra border wires having the outer-diamond wires wrapped about them. All of the twisters having hollow centers, it follows that the fabric may be narrowed as desired and extra-strong margin wires put at the edges regardless of width of fabric.

275 But Sedgwick provides for making the Sedgwick twin netting, as illustrated in Fig. 2 of my former answer, this netting consisting in effect, of two narrow fabric- united edge to edge upon a common wire upon which the inner marginal diamond of the two fabrics break joint, there being no intertwisting of these inner marginal diamonds of the two fabrics, and no union of the two fabrics except as they are strung, independent of each other, upon a common wire. A wide fabric may thus be made up of as many narrow fabrics as desired.

Sedgwick, in making this peculiar Sedgwick fabric, runs his special intermediate wire from a stationary reel like G^1 in Fig. 3, carrying the wire thence inwardly and around a sheave like g^9 and then up like wire G^1 through the twister corresponding with the desired location of this special wire, the wire being passed, however, through the center of the twister instead of through the slot, so that the wire

is given no twisting motion by the twister. Then, when the twister operates, it has a wire D^2 in one of its slots, and this wire it twists around the special wire in question, the orbital movement of reel D^2 preventing rear twists. This results in the edge diamond of one of the side fabrics being twisted around the special wire in question. After each twisting operation, the woof wire carried by the twister in question is removed from the slot of the twister and deflected into the next twister pertaining to that side of the fabric, and at the same time the woof wire pertaining to the nearest diamond of the other fabric is moved into a slot in the special twister in question, the result being that one twisting operation twists a woof wire of one fabric around the special wire, the succeeding operation twisting the woof wire of the other fabric around the special wire, these twistings being separated a half diamond in distance, the diamonds of the two fabrics thus breaking joint upon the special wire.

Now, to produce Kitselman fencing, two woof wires must be simultaneously intertwisted and twisted around a straight wire, and in order to do this a twister must contain three wires at one time, viz., a straight wire passing through the center of the twister, and two woof wires to be twisted together and around that straight wire, and no machine can produce this Kitselman fabric which cannot
276 thus deal simultaneously with three wires. The Kitselman patent is the first exhibit in the art showing a twister thus dealing with three wires, and the Davisson patent is the first exhibit of a machine having capacity thus to deal with three wires. The Sedgwick machine has the hole in the center of the twister for the passage of the straight wire, and it has two slots in the twister for the passage of the woof wires. So far as the mere twisting operation is concerned, here we have all that is needed. But, in the twisting system of the old machine, as represented by the Sedgwick patent, the rear twists must be taken care of, and Sedgwick, notwithstanding his complicated twist-preventing feeding machine, has no capacity for taking care of rear twists if an attempt be made to cause a twister to deal simultaneously with three wires. The Sedgwick twin netting, with its special straight wire, requires a twister to deal only with two wires at a time, a straight wire and a woof wire, the woof wire with which it deals being, first, the woof wire of the fabric at one side of the straight wire and, next, the woof wire of the fabric at the other side of the straight wire. In Fig. 3 of Sedgwick's drawing, assume wire G^1 to be the straight wire passing through the center of the twister, D^2 being the woof wire which the twister is to twist around it. The orbital motion of reel D^2 will take care of the rear twists, and no entanglement will result. Now, D^2 represents one of the woof wires of a pair, and the other woof wire of the pair, representing half the woof wires in the fabric, comes from a fixed reel at G^1 and goes up to the twister. Assume wire D^2 in one slot of the twister in question, and assume the second woof wire coming from a fixed reel at G^1 to go up to the second slot in the twister, wire G^1 being the straight wire passing through the center of the twister. Now, turn the twister, and both these woof wires will be most beautifully twisted around the straight wire, just as is desired in

producing Kitselman fencing. But see what has happened in the rear, or below the twister. The orbital motion of reel D^2 has prevented any entanglement of wire D^2 as the twisting took place. But another woof wire has been given the twisting motion, and the foot of that wire has no orbital motion to take care of its rear twists, but comes up from a fixed point represented by its sheave g^3, the result being that the second woof wire
277 is given a fatal rear twist about the straight wire and the machine must necessarily come to a standstill after one twist has been given. It is this second woof wire which produces the fatal entanglement, for no provision has been made for taking care of it. It is precisely as if reel D^2 with its orbital motion was omitted and an attempt was made to twist a single woof wire around the straight wire when no provision was made for taking care of the rear twist of that single woof wire. Sedgwick provides for dealing with a single woof wire in connection with a straight wire, and he arranges to take care of the rear twist of that single woof wire, but he cannot possibly take care of the rear twist of a second woof wire being twisted at the same time around the straight wire.

Such is the operation and such the limitations of the Sedgwick machine. It can deal with a straight wire and a woof wire in a twister at one time, but it cannot deal with a straight wire and two woof wires in a twister at one time. It can make Sedgwick fabric composed of independent fabrics with their edge diamonds breaking joint and strung upon a straight wire, but it cannot make the Kitselman fencing.

Mr. Wiles has entirely misapprehended the working of the Sedgwick machine, or he would not for an instant have assumed it capable of producing the Kitselman fabric. He has also misapprehended a statement in the Sedgwick specification, reading as follows:

"In case tension wires running through the fence, but not deflected, be introduced, they would also pass through the eyes of the twisting discs and play in these slots k^2."

The reference to slots k^2 has to do with the shifting mechanism, which need not be now considered. The tension wires running through the fabric, but not deflected, are the straight wire to which I have referred, on which the diamonds of the two side fabrics are twisted and break joint, but are not intertwisted, the operations and the limitations of the machine being as I have described.

All of the old exhibits referred to by Mr. Wiles in connection with the Kitselman fabric have now been considered, with the re-
278 sult that the fact becomes emphasized that prior to the patents in suit there was no disclosure of the Kitselman fabric and no disclosure of a machine capable of making the Kitselman fabric, and no disclosure of a machine involving a wire-twisting operation in making netting and capable of having one twister simultaneously deal with two woof wires and intertwist those two wires around a straight wire.

Now, as to mechanism. I have explained, as incidental to a consideration of the general subject and the Kitselman fabric, that the old netting looms had twisters in the form of gears which were

slotted or split to perform the twisting and provide for the transfer of the woof wire; that these twisters were fed from woof reels disposed to the rear of the twisters; that if these woof reels were stationary, then fatal rear entanglement of the wires would take place and prevent any useful operation of the machine; that the old machine, in recognition of this matter, provided mechanism to the rear of the twisters to take care of these rear twists; that the machines took on the general aspect of dual machines, one to do the active twisting and the other to feed the wires to the twister in such manner as to prevent rear entanglement; that Davisson, in the first patent in suit, heroically cut off the rear offending member and placed his reels clear forward in the fighting line, so that there were no rear twists and no rear in which those twists could take place; and that Davisson perforated all of his twister spindles, thus endowing his machine with the capacity of having a twister deal simultaneously with three wires, one central wire and two woof wires, without any danger of entanglement and without the need of five cents' worth of mechanism to prevent the entanglement. In this connection attention is directed to the certified model of Nesmith's patent, in which it will be observed that the mechanism of the feeder, for merely taking care of rear twists in a machine capable only of dealing with two wires in the twister, is as big and as impressive as the twisting machine itself. And regarding the Sedgwick's patents, it is to be stated that the rear machinery for taking care of the rear twists, and capable only of dealing with twists involving two
279 wires, is very much more bulky, complicated and expensive than the twisting mechanism itself. Davisson's twisting mechanism is simpler by far than the twisting mechanism of any netting machines of the prior art, for he cuts entirely loose from abominable split gears and slotted gears, and so far as rear mechanism for taking care of rear twists is concerned, he dispenses with it *in toto*, and his simple twister can deal with three wires and produce results not before provided for or suggested. I will now consider the Davisson patent.

In Fig. 1, A indicates the twisting spindles, arranged to be given the desired number of turns. Each bears a pinion, *a*, operated by a rack, J, common to the series of twisters. These pinions, or gears, *a*, are not twisters nor are they split or slotted. They are mere mechanism for giving rotation and are simple ordinary transmitting gears. On the end of each spindle is a transverse member or cross-member, *f*. It is the duty of these members to carry the woof reels and cause them to be turned in an orbit as the spindles turn. They are called "cross-heads," not an inappropriate term for expressing the idea of a reel support crossing the axis of the spindle. G indicates the reels for the woof wires. These reels are encased, and take on a disk form, the axes of the reels being at right angles to the axes of the spindles. Fig. 10 shows a reel and its case, the wire leading from the reel outwardly through the case to the point of twisting, and the reel being capable of rotation on its axis so as to properly yield up the woof wire. These reels and their cases can be taken off of the cross-head of one spindle and put onto the cross-head

of another spindle so as to effect the desired transfer of woof wires. In Fig. 1 the outer spindles each are carrying one woof reel while the center spindle is carrying two reels, the intermediate spindle being empty and retired below the zone of operations. In Fig. 1 certain twists are completed, the two inner wires being twisted together, and the two outer woof wires being twisted around the straight border wires which come up through the open centers of the outer spindles. It is to be observed that the reels are right at the twisting points and, in effect, themselves do the twisting, there being no rear feeding machine or possibility of rear entanglement. And it is obvious that if a straight wire runs through the central spin-
280 dle the two central reels will intertwist their wires together and around that straight wire, any spindle thus being capable of dealing simultaneously with a straight warp wire and two woof wires without any possible danger of entanglement or any necessity for mechanism of any character whatever to prevent entanglement, there being no rear-wire mechanism and no feeding of woof wires from the rear to the active twisters.

The twists illustrated as being just completed in Fig. 1 having been done, it is now in order to transfer the reels. The idle intermediate spindles are now brought up into line with the other cross-heads and the outer reels are shifted from the outer spindles to the intermediate spindles, and the inner reels are transferred from the center spindle to the intermediate spindles, the outer and center spindles then being retired, thus leaving the four reels on the two intermediate spindles ready to produce the twists and meshes such as shown just above those which Fig. 1 shows as being made. The machine is a fixed loom driven by power, and the transfer of reels and retirement of idle spindles is effected automatically. All of the active twisting mechanism, and all of the mechanism concerned in the twisting at all, is concentrated in the shallow compact zone of the reels, the extended mechanism below pertaining to the peculiar system of transfer of reels which involves a transverse shifting of the reels and also a longitudinal motion of the spindles and their cross-heads.

Claims 2 and 3 of the patent read as follows:

"2. In a machine for making wire fabric, a series of spindles arranged in a line and mounted in bearings on a suitable supporting frame, and having on each spindle a cross-head carrying reels for wire on opposite sides of the axis of said spindle, substantially as specified.

"3. In a machine for making wire fabric, two or more hollow spindles adapted to admit the passage through their axes of wires forming the edges of the fabric, and having on each spindle a cross-head carrying reels for wire on opposite sides of the axis of said spindle, substantially as specified."

281 I look upon claim 2 as involving a series of spindles or equivalent rotators for frontal woof reels; suitable supporting bearings for such reel-rotating agents; a cross-head on each rotating agent to give frontal support to woof reels mounted with heir axes at right angles to the axes of rotation of the spindles or

rotating agents, and to permit transposition of such frontal reels from cross-head to cross-head; and woof reels transposably carried by such cross-heads at the front of the transmitting mechanism which rotates the cross-heads in unison.

I look upon claim 3 as involving the same matter when the rotators are hollow or provided with central passages to permit the presence of warp wires about which the frontal reels twist the woof wires. The entire twisting scheme of Davisson's mechanism represents a radical departure in the art of machines for making wire netting, and I know of nothing in the prior art to materially limit or qualify the invention or impose upon the claims any construction not commensurate with the improvement wrought in the art by Davisson.

A consideration of the prior art would, in my opinion, simply serve to emphasize the bold originality of the Davisson scheme. Mr. Wiles has considered some of the old machines at great length. Regarding those about which he has said the most, I think it will be sufficient to merely consider what would be necessary to change those machines to the Davisson system and what would be the result after the change was made. I will thus take up the old machines.

Nesmith's patent No. 10,143.

A mere look at Nesmith's drawings or at the certified model is sufficient to distinguish it away from Davisson. Nesmith has twisters, and reels to the rear of them, and the problem of fatal rear-entangling twists. Davisson has no reels at the rear of his twisters, and has no rear, and has solved the problem of rear twists by simple process of canceling the prime factors. Nesmith starts out by saying "The principle and main features of novelty of my invention consist in the principle of the revolving of the wires parallel to each other at the same time they are being twisted." Davisson
282 does not revolve his wires parallel to each other, for he quite abandons that rear region of the machine in which Nesmith seeks this parallelism, or, as Nesmith states: "They revolve exactly with each other, so as to keep the wires parallel and getting entangled with each other." Nesmith's machine is composed of a twister to do the work and a feeder of equal dignity to feed the wires to the twister and keep them from rear entanglement, or, as Nesmith states, his machine is "composed of two parts connected together by two shafts, as seen at P and Q, Fig. 1, and one of said parts I call the 'twister,' the frame of which is shown at A, A, Fig. 2. The other part I call the 'feeder,' the frame of which can be seen at D, D, Fig. 2." Davisson has no dual machine; he has no feeder, or need of one, and he has no such twisting mechanism as Nesmith's, which needs a feeder.

Recess until 2 o'clock p. m.

After recess.

Nesmith has his woof reels to the rear of his twisters, or, stated otherwise, he has his twisters in front of his woof reels. Davisson,

on the other hand, has nothing in front of his woof reels, those reels themselves being right in the line of action and virtually constituting the twisters. Nesmith has twisters formed by slotted gears through which slots the woof wires pass. Davisson has no slotted gears, and the only gears he has are those merely incident to the transmission of the rotary motion essential in the twisting operation, Davisson's twisters being formed by his reels which are in front of the gears which operate them. Nesmith brings his woof wires from the rear forwardly through the slots of his twisting gears, and in making transfers he needs to move these passing wires from the slot of one gear to the slot of another gear, and this he does by means of wedges entering between the wires. Davisson, on the other hand, does not bring his wires from the rear, and has nothing to do with slots in gears or otherwise, and performs no shifting by directly attacking any wire, but he performs his shifting by transposing the frontally disposed woof reels bodily from one rotating agent to another. Nesmith has perforations or passages through his outer twisters only, and hence cannot put special straight border wires at both edges of a narrow fabric, nor intermediate warp wires in any fabric, while Davisson has all of his rotators perforated so as to permit the presence of warp wires at any twist in the series. No twister of Nesmith can deal with more than two wires, a straight border wire and a woof wire at his outer twister, or two woof wires at intermediate twisters, while Davisson's intermediate twisters can all deal with three wires, a straight warp wire and two woof wires.

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I here wish to call attention to a point about the Nesmith certified model. Looking at the face of the twisters, it might, at a hasty glance, be inferred that all were centrally perforated, all looking alike on the face. But only the outer ones are perforated, as will be seen by looking through them or looking at the back hubs of the twisters. The rudimentary perforations seen in the intermediate twisters are merely the countersinks employed by the lath-man in supporting his work in the lathe while being turned on conical lathe centers. In the partial model produced by defendants, a model showing the feeding devices instead of the twisters, all of the feeding spindles have been perforated, which is contrary to the Nesmith patent. It is to be remembered, also, that the model produced by defendants is the feeding machine only of Nesmith, and not the twisting machine; a part of Nesmith's machine which, instead of being intended for the production of twists, is intended for the prevention of twists. Defendants' model, instead of being the head and front of the Nesmith machine, is the mere tail of it. The production of this tail-end model of Nesmith, in connection with Mr. Wiles' remarks regarding it, might be taken as meaning that in view of the teachings of Davisson the tail of Nesmith's machine can be taken in hand and suitably modified, and segregated from the head of Nesmith's machine, and make a better twisting machine than the head plus the tail of the machine as Nesmith had it. But everything that has been done in this direction is directly violative of the law of Nesmith's structure. Nesmith took his twisting machine and put his feeding machine to the rear of it in such relationship that

the feeding machine could not produce twists, the very purpose of the feeding machine being to carry the wires parallel and
284 prevent the formation of rear twists. In defendants' treatment of the subject it is proposed to disassociate Nesmith's two machines, and discard his twisting machine, and put his feeding machine into some sort of association which will cause it to produce twists instead of prevent twists. It must be remembered that no twisting machine will twist two wires together unless the wires are held against rotation in front of the twisting agent. In Nesmith's feeder the wires come forward from the rotary feeding spindles, so to call them, directly into the twisting spindles rotating in perfect unison with them, thus insuring parallelism and non-twisting of the wires in front of the twisting spindles. In defendants' model the wedges have been slotted so as not to interfere with the passage of warp wires through the intermediate twisting spindles. This is contrary to the Nesmith patent and certified model which has no perforation in the intermediate spindles and which has solid wedges positively prohibitive of the presence of warp wires in such perforations, if they existed. Again, while Nesmith explains that it is his desire to place at the rear of his twisting machine a feeding machine to carry the wires parallel and prevent rear entanglement, and while he provides that feeding machine with slotted spindles rotating in unison with the twisters, thus guarding against the possibility of entangling twists between the feeding machine and the twisting machine, he does not at all explain how his wires are dealt with within the feeding machine, and his drawings are quite vague and unsatisfactory on this point. He explains that his woof wires are on reels, and that these reels are mounted on "reel stands." These reel stands are designated by the letter I in his drawings. But there is no description whatever of the manner in which these reel stands are mounted, or how they are supported, or what motions are given to them, or to the woof reels which they carry, and the drawings throw absolutely no light upon the subject. The reel stands are described as "movable," but it is not stated what movement they have or how it is produced or whether it means anything more than mere removability. The Nesmith feeding machine may or may not be adequate and operative. But there is nothing in the specification or drawings on which to found an understanding of adequacy and operativeness or to lead to the positive conclusion that the
285 machine had been thoroughly worked out to success. And, unfortunately, the certified model has been through the fire and lost its reel stands and reels and whatever special appliances may have been provided for supporting and moving them. But defendants, in constructing their model, and apparently seeking to produce a certain structure for a certain purpose, have taken considerable liberty and have put in things not found in the Nesmith drawings or justified by the description, and have left out things called for by the drawings and by what is left in the certified model. For instance, as before stated, the Nesmith patent says and shows nothing about how the woof reel stand-, I, are mounted or what

movements are given to them or how the movements are given. Defendants mount the ends of these reel stands in the slots in the rotary gears of the feeding machine and arranges wedges to shift those reel stands from the slots in one gear to the slots in another gear. There is no authority for this arrangement in the Nesmith patent, for the patent does not state that there is any transposition or any other specified movement of these reel stands. It states that the wedges are to transpose the wires, but does not even intimate that they are to be employed in transposing reel stands or that they have anything to do with the reel stands. Nor do the drawings show that the reel stands are in any way carried in the rotary gears of the feeding machine. And in defendants' model the ends of the reel stands, in order that they may co-operate with the wedges which shift them, which wedges are stated in the patent to be for the purpose of shifting the wires and which the model unfits for attacking the wires by adapting them for use in shifting the reel stands, have been given a diamond form distinctly opposed to what is clearly shown at the ends of the reel stands, the ends in the drawings appearing as flat rectangles. With the unwarranted modification, transpositions and motion qualities which defendants have put into the model it is said that it is Nesmith, and that it is adequate. The model contains things and qualities not found in Nesmith, but it also lacks certain things found in Nesmith. As before stated, the Nesmith drawings are quite vague in all matters pertaining to the mounting and movements, if there are movements, of the reel
286 stands, and the specification is silent on the subject. But in the drawings, on the inner faces of the feeding gears, there are vaguely shown some mechanical details which are not recognizable or in any way determinable from the drawings, and there is no description of the matter. Going to the certified model, it is found that the feeder gears each have a pair of studs projecting from their inner faces, these studs being slotted and provided with blade springs flexing across the inner faces of the gears, a few only of these springs remaining in the certified model, broken stubs of some of the remaining springs remaining in their studs. I judge the model to have closely copied the original model in its damaged condition after the fire. Having seen these studs and springs in the model, it can be recognized that the drawings of the patent were intended to show such construction, but there is no showing or explanation of what these parts are for or what engages them or, in in fact, anything about the inner parts of the feeding gears or the ends of the reel stands except that the ends of the reel stands are flat rectangles instead of the diamonds found in defendants' model. And in defendants' model there is nothing of these studs and springs. It would seem that defendants have sought to construct a machine different from, and, perhaps, better and perhaps simpler than the Nesmith machine, and finding no use for certain parts at the inner faces of the feeding gears.

Mr. Wiles has produced a drawing of a further proposed modification of this Nesmith model, the drawing being marked "Defendants' Exhibit Illustrative Drawing." It proposes, as a possible con-

struction, not however represented as being suggested by Nesmith, a pair of parallel bars rigidly uniting the front and rear feeding gears. The purpose of this illustration, as I understand it, is to show that while Nesmith's system of reel stands involves a feeding gear at each end, requiring to be each independently driven, it might be possible to unify the gears by these rigid bars so that one driving apparatus would answer. I don't see what this has to do with the case, for with all the changes that may be rung upon it the Nesmith machine is not a machine on the Davisson system, but, on the contrary, it is an excellent example of the type of dual machines comprising a twister and a rear feeder designed to take care of the fatal rear twists. Davisson cuts loose
287 from the whole scheme. He goes back to the rear feeding part of the compound machine and takes therefrom the woof reels. He takes these woof reels over to the extreme front of the twisting machine. He then goes back and kicks the entire remainder of the feeding machine overboard. He then goes forward to the twisting machine and kicks the slotted twisters overboard. He arranges his woof reel right at the front in the twisting zone where they themselves will do the twisting without any further thought about embarrassing rear conditions. He arranges these frontal reels on heads or carriers extending across the axes of the lines of twist, so arranging the reels that they can be shifted into association with one cross-head or another. He provides a rotator, exemplified in the form of a spindle with a suitable bearing, for each of these cross-heads. He gears these rotators for rotation in unison by suitable ordinary transmitting gearing exemplified as a system of simple gears engaged by a rack. He pierces the center of all of the rotators so that a warp wire can pass through the orbit of motion of any of the twisting reels. This is what Davisson has done in revolutionizing the twisting system, and I cannot see that he has saved anything from Nesmith except the woof reels, which he has given new location and clothed with new office and endowed with improved capacity. He has thrown away Nesmith's entire feeding machine, saving the woof reels, also the twisters, also the wedges for attacking the wires and shifting them from one twister to another, and he has provided no equivalent device for attacking the wires, for he simply transposes his wires by shifting the woof reels bodily. The Nesmith machine has no single element of the claims of the Davisson patent sued on. Davisson's spindles, as rotators having frontal heads crossing the axes of the rotator to carry frontal twisting reels, are not found in Nesmith, nor is there anything found having any such mode of operation or capacity. The woof reels of Davisson frontally mounted on the heads of the rotators in the twisting zone and having the office of carrying and twisting the woof wires, are not found in Nesmith. Having a machine constructed according to the principle of Davisson, and desiring to change it into a machine in accordance with the Nesmith principle of operation would
288 require, at the very start, that Davisson's frontal reels be taken from their fighting-line position and moved clear to the rear. This removal of the reels has removed Davisson's twisters. There-

fore, twisters must be provided, say some slotted-gear system. Davisson's cross-heads will not be needed and, furthermore, must not be present, for they would be in front of and interfere with the twister gears. Throw them away. Twisting has now been provided for, but there will be rear entangling twists putting a stop to the operation of the machine after one twist has been made. Twist-preventing mechanism must be applied in the rear regions.

And Mr. Wiles states that, in his opinion, the Nesmith patent represents the nearest approach in the prior art to the machine of the Davisson patent.

Sedgwick's patents No. 218,323 and No. 238,033.

Little need be said about these machines in view of the description I have given of them in considering the Kitselman fabric and in view of the fact that they fall into the same old class with the Nesmith machine involving essentially a series of slotted gears to do the active twisting; woof reels to the rear of those twisters; rear twisting conditions which will be fatal if not provided for; and rear twist-preventing mechanism greater in complexity and cost and bulk and need for power than the twisting mechanism itself. The general analysis which I have just applied to the Nesmith machine will apply equally as well to the Sedgwick machine. In changing the twisting system of Sedgwick to the twisting system of Davisson only the woof reels would be of any practical utility. The Sedgwick machines, like the Nesmith machine, merely serves to illustrate the bold departure effected by Davisson. He throws away most all of the old parts pertaining to the twisting and by very few parts in novel relationship produces a simple machine, wonderfully simple compared with the old ones, having new mode of operation and capable of new results.

I have, therefore, in considering the Kitselman fabric, explained that Mr. Wiles was mistaken about the capacity of the Sedgwick machine, and have explained the peculiar twin fabric which the machines would make. I am acquainted
289 with Mr. Sedgwick and he is a client of mine at the present time. His machines are operated in Detroit by a company. I here produce a catalogue of the Detroit Fence & Wire Goods Co., "manufacturers of the celebrated Sedgwick woven-wire fence," and suggest that it be marked "Sedgwick catalogue." The fabrics generally shown are simple netting, but on pages 4 and 8 will be found illustrations of the Sedgwick twin netting consisting of an upper fabric and a lower fabric breaking joint on an intermediate wire.

Whitehead's British patent 1285 of 1854.

This exhibit has been heretofore referred to and somewhat analyzed in its mechanism. The machine set forth is good for nothing for any useful purpose, for reasons which I have already explained. But if it would do the work intended and operate in the proposed manner it would merely illustrate the general old type of machine comprising twisters at the front; woof reels at the rear of the twist-

ers; rear twisting conditions; and rear machinery to take care of these rear twists. It has split gears to act as twisters. It has no single element of Davisson, not even the woof reel. Davisson cut loose from all such things as split gears and slotted gears and rear reels and rear twist-preventing mechanism. This so-called British patent is not a patent at all, but merely a provisional specification, as it is termed in the British patent office, and no patent would issue until the matter was completed, and the heading states that it was not completed.

Smith's British patent No. 2516 of 1876.

This so-called patent is not a patent at all, but only a provisional specification which was never completed. Out of its abundant vagueness it can be understood that it is proposed to use split twisters. This of itself would differentiate a construction from that of the Davisson patent. Again, it refers vaguely to "side segments traveled to and from to form the twist," a system of twisting certainly not like Davisson and not recognizable as being like anything else found in the art as disclosed in the present record.

290 The above are all of the prior exhibits considered by Mr. Wiles as having a bearing upon the Davisson patent, and it seems to me that none of these exhibits, nor all of them taken together, would have any effect in materially limiting or qualifying the invention exhibited in the Davisson patent and recited in the second and third claims thereof.

The Kitselman patent in suit.

The old field machines made only picket fences. In connection with any thought of netting fences made *in situ* the whole fraternity of these old picket machines were only suggestive of something earnestly to be hoped for, but apparently incapable of realization. The old netting machines with their front and rear complexities, complexities in severalty and in common, were prohibitive as field machines. Davisson revolutionized netting machines, dispensing with the old rear portion and employing a front portion of great simplicity, as far as the twisting was concerned, but providing for the transfer of woof reels only by means of longitudinal retiring and advancing motions for the twisting spindles, a system of transfer involving bulk and workmanship and cost quite inconsistent with field machines. Kitselman adopts the Davisson system of twisting and transverse transfer of woof reels, but, by the superposition of original invention effects the transfer by transverse motion only, thus at once bringing netting machines into condition available as field machines of compactness, cheapness, efficiency and lightness of operation. He extended the hollow spindles of Davisson clear forward into the twisting zone and provided them with cross-heads at their fronts and rears. He placed his woof reels in reel-carriers arranged for transverse motion on these cross-heads so as to be capable of turning with the spindles and of being transferred from spindle to spindle as in Davisson, the

transfer, however, being effected by transverse motion only. In the Davisson construction, as exemplified in the Davisson patent, the reels, or their cases, were the twisters, the spindle forming the rotator standing well back of the reels and well back from the twisting zone, a given spindle with two reels therefore presenting the aspect of a two-part twister rotated by the hollow spindle
291 through which passed the warp wire going unsupported forward to the twisting zone. Kitselman, by extending the hollow spindle forward clear to the twisting zone, gave the warp wire support against the side strains of the woof wires right in the zone of twisting, the spindle thus becoming a supporting agent in the twisting and the entire twister, formed of the reels with their cases and the spindle, forming a three-part twister. By stopping the cross-heads when in line he could shift the reel-carriers to other spindles, as in Davisson, except that no longitudinal motion of the spindles was necessary. At each side of the rank of twisters he arranged switch-boards having notches engaging the reel-carriers, and by properly reciprocating these switch-boards he could shift the reels from spindle to spindle as desired. He arranged a special hand lever for operating these switch-boards. He placed the spindles far enough apart to permit the orbital motion of the woof reels without interference, and then, at the rear of the twisters, he provided the spindles with directly intermembering simple gears by means of which all the twisters could be turned in unison through the medium of a hand crank. Adequate provision was made for moving the very compact little machine along the line of fence as the weaving progressed, it being understood that in previous netting machines the machines were always fixed factory machines in which the fabric was the portable element and advanced through the machine. The result of Kitselman's invention was that netting machines became as available for field use as picket machines had previously been. And Kitselman first exhibited, in his patent, the Kitselman fencing with warp wires running through all of the diamond intersections of the netting and having the woof wires intertwisted with each other and around these warp *warps*, yielding an integral fabric, of peculiar strength and stiffness, with all its units co-operating in giving the fence its superior strength.

Without the invention superposed by Kitselman upon the Davisson system a field machine for weaving netting *in situ* does not appear to have been possible; and without the Davisson fundamental system of netting machines it does not appear that field machines for weaving netting would have been possible.

292 Kitselman illustrates and describes his machine as a field machine, but, apparently recognizing its peculiar compactness and simplicity and adaptation to hand operation, he suggests the use of the machine indoors by supporting it horizontally on legs. It is with the aspect of his machine as regards the compactness and simplicity adapting it to portable or field use that we are at present concerned.

Adjourned to tomorrow morning, at 10 o'clock.

JANUARY 28, 1899—10 o'clock a. m.

Met pursuant to adjournment; present: same as before.

The WITNESS (continuing): The Kitselman specification, states, just preceding the claims:

"I do not wish to be understood as confining myself to the exact details of construction and form and proportion of parts herein shown and described as an embodiment of my invention, as I am aware that numerous changes therein can be made without departing from the spirit or sacrificing the advantages of my invention."

I understand from this that the specific construction shown and described is to be considered as a mere exemplification of the invention, and subject to modifications in details not inconsistent with the invention.

I do not know that it is needful for me to quote the numerous claims in suit, as they have been already several times quoted in the record and are readily accessible in the patent itself.

Regarding the first claim: I understand this claim to refer to the Davisson twister system, which is, as I have before stated, a two-part system or two-section system with a hollow rotator for each twister, the improvement referred to in the claim being the provision of a central twister section carried forward into the zone of twisting or into the plane of action of the aggressive twisting agents of the woof reels. In Davisson the reels were in reel-carriers
293 of disk form of cases, the woof wires passing out to the field of twisting through frontal eyes in the reel-carriers, these eyes forming the aggressive twisting agents for the woof wires. Kitselman has the same eyes in the same plane and acting in the same manner to form a two-section twister, but he carries his central section forward into this same plane and causes it to carry the warp wire and give it support in the same plane, the warp wire, or border wire, as the case may be, being thus supported in the plane of aggression of the twisting eyes of the side sections so as to resist the side strain imposed by the transverse pull of the woof wires. The office of this central section, in merely carrying the warp wire, is in nowise dependent upon any rotation of any part of the system, rotation being an attribute of the side section- which carry the woof reels in their twisting orbits. The functional two-section twister must have the rotary movement and the shifting movement of Davisson and the central section must carry the warp wire, and the shifting side sections must receive their rotary motion from the central rotary motion of the twisting mechanism, the central section of the twisting mechanism having a fixed position to carry the warp wire and give rotary motion to such of the side sections as may be brought into association with it from other twisters.

The improvement referred to in this claim would obviously better the Davisson machine, regardless of any modification of the driving system or shifting system.

Regarding the second claim: I understand this claim to refer to the same matter when the shifting is accomplished without longitudinal movement of the central portion of the twister or, in other

words, by the simple transverse movement of the side sections, thus radically improving the Davisson system as regards the manner of shifting, and adapting the Davisson system to a compact embodiment consistent with a portable machine. I have spoken of the shifting of the side sections very frequently as being "transverse." The claim uses the term "longitudinal." Both terms mean the same thing when analyzed, the shifting motion of the side sections being transverse to the axis of the twister, and longitudinal to the entire series of twisters.

294 Regarding claim 9: I understand this claim to refer to the same matter when the central sections of the series are disposed such distance apart as will permit the turning of the woof reels without interference between contiguous twisters, the central rotating section of each twister being directly provided with a spur gear of sufficient diameter to engage the gears of the adjacent twisters whereby a simple train of gear gives simultaneous motion to all the twisters. Davisson had a simple gear on each spindle, but these gears did not engage each other, all being engaged by a common reciprocating rack. The simple intergaging train of gears was well known in the old field machines for making picket fences, but those machines had no reels or shifting sections whatever to deal with. In the Davisson system of driving the twisters, the number of permissible twists was limited by the permissible stroke of the driving rack, while in the intergeared system there is no limitation, it being possible to shift side sections from one set of spindles to another and then, when in their new position, give them any desired number of orbital turns.

Regarding claim 10: This claim appears to refer to substantially the same matter, but mentions specifically the woof reels as being carried by the side sections. This claim requires that the twisters, as twisters, shall be geared directly together, but does not, like the ninth claim, require that the gears be on the central sections of the twisters, the tenth claim probably contemplating any system of direct intergears which gives rotary motion to the essential rotary portion of the twisters.

Regarding the fifteenth claim: This claim would appear to refer to the same matter as the tenth claim when the shifting of the side sections is accomplished without longitudinal motion of the central sections, and to also involve the bringing of the cross-heads of the central sections into line, or into registering position to permit of transferring the woof reels, by the rotary motion given simultaneously to all of the central portions, and by that motion only, or, in other words, the rotary motion of the parts serves not only in producing all of the functional twisting motion, but also in producing all of the conditions necessary to permit of the shifting of the side sections being effected. This claim also involves the intergearing of the twisters.

295 Regarding the twentieth claim: This claim refers to the same subject-matter as the fifteenth claim, but requires that the intergearing of the twisters shall be accomplished by intergearing their central sections.

The terms "align" and "register," as used in some of the claims, mean the bringing of two twisters in such relative angular position as is consistent with the initiation of the transfer of woof reels from one twister to another. In Davisson this registering or receptive condition is brought about by a compound movement of the spindles, an angular adjustment and a longitudinal adjustment being requisite, while in Kitselman an angular motion only is needed, this motion being produced by the same simple mechanism which is employed in producing the twist.

Mr. Wiles, as I understand him, is of the opinion that Kitselman, having found that a good netting loom had been produced, and having found that portable looms had been employed in the field for making picket fences, there was no invention in producing a field loom for weaving netting *in situ;* that it was merely a happy thought, so to speak. Now, I must quite disagree with Mr. Wiles on this matter. Looking at the Davisson fixed loom, the only thing worth considering in connection with the subject, and being fully possessed by the happy thought of making netting in the field, I think the netting loom was of such character of construction as to repel the idea that it could ever be licked into shape adapting it for field use. He of the happy thought when gazing upon the fixed netting loom would find the loom both attracting and repelling the thought. I think that only a genius could have found sufficient encouragement to justify procedure. And, knowing fully of the advantages inherent in the old field machine in making picket fences, over fixed machines for making the same fences, and knowing of the discouraging qualities apparently inherent in the weaving of netting as done in the fixed loom, I would be inclined to say, if told that some one had succeeded in developing a field netting loom, that, regardless of how he had accomplished it, he must have brought to bear upon the subject a high order of invention.

296 Mr. Wiles has, of course, not been able to refer to any machine prior to Kitselman for weaving netting *in situ*, but has contented himself with seeking in the prior art various details which Kitselman could avail himself of or did avail himself of. I think Mr. Wiles is in error in many of his comparisons, and I also think that it is not to the discredit of a bold inventor that he has not been called upon to invent each individual detail of his generally original machine. Nuts and screws and gears and cranks and electro-magnets and batteries and wires are in the common repertoire of the arts, but, nevertheless, many important inventions have been brought about by employing them, and many more will probably be brought about in the future.

I will now take up earlier patents which Mr. Wiles appears to think have been of vital aid to Kitselman, so vital, in Mr. Wiles' opinion, as I understand it, as to fatally detract from Kitselman's claim to original inventorship. It is to be observed that with exhibits representing several different examples of machines for making picket fences before him, Mr. Wiles refers to none of them as pertinent to a consideration of the Kitselman patent further than as suggesting the idea of a field machine as distinguished from a

fixed machine for making fencing. I will refer to the separate patents from which Mr. Wiles appears to think Kitselman has taken his details.

Whitehead's British patent *of* 185 of 1854.

A provisional uncompleted specification instead of a patent, as I have before explained, and a machine full of blunders and quite incapable of any useful operation whatever, as I have heretofore pointed out. A machine with split gears to act as twisters, the warp wires coming to these twisting gears from reels at the rear and requiring rear mechanism to prevent rear entanglement. Mr. Wiles is of the opinion that here is where Kitselman's shifters came from. Kitselman's specific shifters, and the shifters of Whitehead, are analogous in that both are long pieces with segmental notches and arranged as reciprocating shifters in a netting machine. But the offices are quite different. Whitehead's shifters are incapable of shifting anything.

297 But, assuming that they would do what what they were intended to do, they have not the performance of Kitselman's twisters. Whitehead employs split gears and split wheels constituting his intended twisters, and when his shifters shift the half gears they have shifted everything of the twisters, including all of the bearings of all the twisting mechanism. Kitselman, in performing his shifting, leaves the main portions of his twisters in their fixed positions and deals exclusively with the side sections carrying the woof reel. Whitehead's shifting board contains his twister bearings. Take these shifters away and you remove the twister bearings *in toto* and all the twisting mechanism becomes dismantled. Kitselman's twisters pertain to side sections only. Remove them entirely, and you have only dismantled the machine as regards the side sections of the twisters, the main central portions of the twisters still remaining in normal position and unaffected. Kitselman's shifters are separated from each other and are quite uninterfered with by the warp wires being woven in the fabric. Whitehead's twisters, best seen in plate 2, Fig. 1, are joined together face to face, and their shifting movement would be fatally interfered with by warp wires, and their presence would prohibit the presence of warp wires. The shifters of Kitselman are found in a different type of machine, are different in construction, different in relationship to each other, different in relationship to other parts, are associated with distinctly different parts, they have a different mode of operation and bring about a different result.

Nesmith's patent No. 10143.

Mr. Wiles expressing the opinion that it was no invention to take the twisting gears of Nesmith and substitute them for the rack movement of Davisson. Kitselman has not done this. All of Nesmith's gears are slotted, and the gears found in the twisting machine, the only gears of direct interest, have the woof wires passing through the slots in them, transfer mechanism, in the way of wedges, forcing the wires from the slots of one gear into the slots of another. And these gears are forward of the reels, in the twisting field, and them-

selves form the twisters. Kitselman has not taken these gears, but, on the contrary, has distinctly discarded them in every sense
298 of their functional characteristic, location and performance.

Kitselman has no slotted gears at all, and no gears in front of his reel, and no gears in the twisting field, and he does not employ gears as twisters. He has not substituted Nesmith's gear for Davisson's rack, but has discarded Davisson's rack and retained Davisson's gears, simple plain gears, and retained them in the Davisson location to the rear of the reels, and has retained for them the Davisson office of transmitting orbital motion to the woof reels. But he has set Davisson's twisters further apart and has enlarged the gears so that they will directly intergear with each other.

Mr. Wiles seems to think Kitselman's twisters are more like Nesmith's than like defendants' twisters. This is obviously wrong. Kitselman's twisters are simply reels and reel-carriers for the woof wires, and perforated central portions for the warp wires, and that is precisely what is found in defendants' machine, while in Nesmith's the reel and reel-carriers have notning whatever to do with the twisters or twisting operation, the twisters being slotted gears far in front of the gears, and the twisting being done solely and entirely by these gears. Mr. Wiles thinks Nesmith the nearest anticipation of Kitselman. It seems to me that Nesmith is about as — possible from Kitselman. Nesmith does not present an element of Kitselman, Nesmith's twisters not being sectional twisters, but being single slotted-gear twisters; Nesmith does not twist by means of the reels and reel-carriers, but solely by slots in the gears. Nesmith has not his reels in the field of twisting, but, on the contrary, has them far back in the rear where additional machinery is needed to take care of rear entanglement. Nesmith cannot intertwist two woof wires and twist them around a warp wire like Kitselman. Nesmith cannot make the Kitselman fencing. Nesmith cannot make netting *in situ*, nor is the principle of construction of his machine adaptable, by any conceivable modification, to such use.

Sedgwick's patents No. 218,323 and No. 233,033.

I cannot be sure that Mr. Wiles allies anything found in Sedgwick with the Kitselman patent, further than as to the fabric, which
299 matter I have heretofore considered. But there is a point or two in Mr. Wiles' deposition which may have been intended to apply to the Kitselman patent. He states that the transversely slotted-wire shifters of Sedgwick might be adapted to the Nesmith machine, thus permitting the presence of intermediate warp wires in Nesmith if the twisting and feeding gears were only drilled to pass the wires, and also as justifying the modifications defendant has put into the model of Nesmith's feeder. But this, however, seems hardly pertinent to the Kitselman patent which has no shifting wedges to separate the wires, transversely slotted or otherwise, nor has Kitselman any conditions calling for attack on the wires in effecting the transpositions of the wires.

Mr. Wiles speaks of the Sedgwick machine as transferring the spools back and forth. The expression "the" spools might lead to

the inference that all of Sedgwick's woof wires were on shifting spools or reels. None of them are on any shifting spools or reels concerned in the twisting operation, the twist being effected solely by slotted gears, the reels being to the rear and arranged with mechanism to prevent rear twists. But only half the woof wires are carried on moving reels, one woof wire of each pair coming from a stationary reel, the rear twist being prevented by moving one of the woof wires and its reel in an orbit around the fellow woof wire coming from a fixed reel.

Smith's British patent 2516 of 1876.

A provisional uncompleted British specification, as heretofore explained. Its suggestions are vague and shadowy beyond the point of comprehension. The foundation structure of the machine or machines to which its suggestions are intended to apply cannot be comprehended or reasonably suspected from anything found in the specification or found in the concurrent art. Mr. Wiles appears to be of the opinion that the Nesmith machine might be taken, and, as I understand it, modified somewhat according to the teachings of the Whitehead British patent, and then be further modified according to the vague suggestions found in this Smith British patent, with the result of producing something of interest in connection with the present art. This hardly needs traversing.

300 Nesmith twists exclusively by means of slotted gears; Whitehead twists exclusively by means of split gears; how Smith twists is not explained; we are told only a word or two, but about split gears; Kitselman has no split gears or slotted gears, and does not twist by means of gears or wheels, but twists by means of the reels and reel-carriers themselves brought right into the twisting field instead of being located at the rear of the twisters proper, as in Nesmith and Whitehead, and, so far as can be understood, in Smith.

Mr. Wiles states that this provisional specification "contains a brief description applying exactly to the Kitselman structure." I cannot concur in this, for I do not think that the British patent can be said to contain a description intelligently applicable to anything, the language being too brief, vague and uncertain to have definite meaning. The language is obviously intended for suggestions applicable to the then current art, and we can find in the old art no machine to which the suggestions would appear satisfactorily applicable at all, and it would appear that Mr. Wiles as mentioned in the paragraph above, has only been able to suggest a composite construction formed by an inconsistent mixture of Nesmith, Whitehead and Smith, the result being a machine which, whatever else it may do, is as far removed from likeness to Kitselman as are any of the specific elements of the mixture taken singly, the machine of the mixture still employing split twisting wheels with reels to the rear of them and requiring rear twist-preventing mechanism, instead of abandoning *in toto* the twisting-gear system and putting the reels in the twisting field direct.

Davisson's patent.

The only reference Mr. Wiles appears to have made to Davisson in connection with the Kitselman patent is in expressing the opinion, as I understand it, that the Davisson machine would infringe the Kitselman patent if defendants' machine would. In my opinion, the Davisson machine is clearly distinguishable from the Kitselman invention in just those respects of the absence of features which fit the highly important Davisson system of twisting to adaptation for use in portable machines, and in some respects, the
301 merits of Kitselman's improvements on Davisson are susceptible of realization in fixed machines. For instance, the bringing of the central portion of the twisters forward into the plane of the side twisters so that the twister becomes in effect a three-part twister, would be distinctly advantageous; so also would be the provision for putting the parts into condition ready for shifting by means exclusively of the mechanism which gives the rotary motion to the twisters; and so also would be the direct intergeared driving system in place of the rack; and so also would be the general fundamental organization resulting in compactness, lightness and portability.

Recess until 2 o'clock.

After recess.

Attention should be called to one important fact in connection with the Kitselman patent. Kitselman, for the first time in the art, discloses the new Kitselman fabric in which all of the intertwists of the diamonds are around warp wires, all of the elements of the fabric co-operating with each other in giving it structural strength. And Kitselman in his patent, for the first time in the art, discloses the manner of weaving this fabric, by causing the twisters to each carry two reels simultaneously in an orbit around a centrally disposed warp wire whereby the two woof wires are twisted around the warp wire at the same point and intertwisted with each other. And no machine of the prior art was capable of doing this peculiar twisting work or of producing this fabric, with the exception of the machine set forth in the Davisson patent. But, so far as shown by the Davisson patent, that fabric and that manner of twisting, dealing with three wires at once, was not contemplated. The Davisson machine is instantly recognized as fully capable of this work after reading the teachings of the Kitselman patent. Davisson suggested border wires only, and all of his spindles had open centers in order that the border wires could be disposed in any spindle according to the desired width of fabric. But in such use of the machine no twister ever dealt with more than two wires at once, border twisters dealing with the straight border wires and the twisting woof
302 wire, while intermediate spindles dealt with the two woof wires. Davisson's open spindles were therefore contemplated as carrying warp wires, but as carrying border wires only and not as carrying intermediate warp wires to conjoin with two woof wires at a single point of twist. Kitselman's twisters, on the other hand, are

expressly stated and shown as carrying not only border warp wires, but also intermediate warp wires at every diamond intersection, and are explained as dealing, not only with two wires twisted together, or one twisted around the other, but as dealing with three wires, two being twisted together and around the third wire. Davisson's patent has the capacity, but is silent as to the use of that capacity and as to the results realizable from that capacity. The performance is latent in the Davisson patent. The performance and the result of it is patent in the Kitselman patent. And in Kitselman's patent and in claims thereof the central sections of the twisters are referred to as sections which carry the warp, and as sections which maintain fixed positions in the warp lines while the woof sections move from warp line to warp line. When the intermediate warp wires are disposed through the twisters it is essential that the central portions of the twisters remain *in situ* at all times and throughout all transpositions of the side sections. In the operation of these netting machines, the work is done by alternating twisters and, at the next step, by the intermediate twisters, half the twisters, considered as mere rotators, being idle, while the other half are at work. Thus, referring to Fig. 1 of the Davisson patent, notice that all the work is being done by the outer and central twisters, the intermediate ones being idle and retired. They are retired in an axial direction only, but so far as their present purpose is concerned they might be retired in any direction, or, for the time being, be removed from the machine, to be replaced when the time arrives for their performance in the production of twists. But in the Kitselman machine the intermediate spindles are to carry warp wires, and to support warp wires against the strains being imposed upon them by woof wires pulled upon by the active twisters. There are, therefore, no idle spindles when Kitselman fencing is being made, and the re-
303 tirement of them would be inconsistent with their performance. It would therefore seem that in the Kitselman patent and claims the three-part twisters are twisters arranged in constant series, all parts having duties in connection with wires, the central parts maintaining at all times their constant location consistent with their dealing with the warp wires, and the side sections being transversely shiftable from one central section to another.

The Kitselman patent, in all the claims sued on, would therefore appear to be clearly distinguishable from anything disclosed in the prior art, in arrangement of elements, relative performance of elements, mode of operation, capacity for field use, and improved character of product.

The Conner patent in suit.

In Davisson's machine the transfer of woof reels was effected automatically by somewhat complex machinery deriving its power from the main driving mechanism of the power-driven fixed loom, the transfer involving a longitudinal movement of the spindles. Kitselman arranged for transfer of woof reels without the necessity for longitudinal movement of any twister parts, but he did not p ovide for automatic transfers, the transfer, on the other hand, being effected

by the movement of a special hand lever. One disadvantage of the hand transfer is that if it be inadvertently neglected there will be a lack of uniformity in the fabric. Davisson, having plenty of power and room, provided for automatic transfer, but Kitselman apparently considered the automatic transfer as inconsistent with his improved purely transverse transfer of woof reels. Conner, in a fixed loom, adopted the Davisson system, but with the Kitselman scheme of transfer by exclusively transverse motion of parts, thus demonstrating, for the first time, that Kitselman's purely transverse system was not inconsistent with an automatic transfer. Instead of using reciprocating shifters, after the manner of Kitselman, he made the side sections of his twisters self-transferring in virtue of their own motion as imposed by the purely rotating central portions of the twisters, the time and direction of transfers being controlled
304 by switches directing the side sections into proper paths of transference. He retained the three-part twister and directly intergeared system of Kitselman. He provided his central sections with notched disks for supporting and driving the side sections, the transfers being effected by the side sections being automatically delivered up from the holding elements of one central section to the holding elements of another central section while all the parts were in motion, time and direction being controlled by the switches.

The second claim of the patent would appear to have reference to a Davisson-Kitselman machine when the central sections are provided with holding elements capable of receiving, holding and discharging the side sections, the receiving and discharging being effected by the simple rotary motions of the central parts of the twisters, switches being provided to determine the time and direction of transference. The claim would appear to be limited to the automatic operation of the switches, but would appear to be independent of the prolongation of the hollow spindles into the twisting zone.

The third claim would appear to differ from the second claim in being limited to the prolonged spindles, and as not being limited to switches operated automatically, so long as they direct the transfers and the transfers are effected by the simple rotary motion of the twisters.

Mr. Wiles has found nothing in the prior art constituting an anticipation, but doubts invention and thinks the details could be gathered from the teachings of the prior art. I think the prior patents referred to by him call for but little remark. I refer to these patents separately.

Winsor's patent 303,306.

This patent has no reference to a netting machine, but is concerned with a machine for weaving weavers' harness, so called, being strap-like suspenders consisting of marginal cords forming the warp, and woof threads running straight across and close together and twisted around the warp cords and knotted together in the middle of the width of the strap. The weaving is done with two
305 bobbins traversed across the fabric in sinusoidal paths, each bobbin traversing the entire width of the fabric, the two bob-

bins twirling about each other *en passant* at the center of the fabric. The machine has no sort of interest except in connection with the system of guides and impellers by means of which the bobbin carriages are passed to and fro across the fabric in laying the straight woof threads and making the proper twists and knots. The bobbins are incapable themselves of laying the woof and they are supplemented by knotting and tucking fingers lying in front of the bobbins and having complicated motions needless to describe. The sinusoidal paths in which the bobbin-carriers move across the fabric are formed by a series of intersecting circles and notched impelling disks, serving in connection with automatic switches to control the to and fro and rotary movements of the two bobbin-carriers. These paths of motion, and these notched disks, and these switches have, in form, strong analogy to features found in the Conner patent, but beyond form the analogy is lost, for the performance is quite different and the result is quite different. In Winsor there are but two bobbins and they lay the warp directly straight across the fabric. These bobbins are mere spools with their axes parallel with the line of fabric. These two bobbins co-act only *en passant*. There is no provision for dealing with more than two bobbins, or for causing any intertwisting of three wires, nor is there anything in the way of netting capacity. Conner has a multiplicity of hollow spindles in line, adapted to carry a series of warp wires. About these spindles two woof reels can twirl and produce the intertwisting of their two warp wires, at the same time twisting these two woof wires about the warp wire. At the completion of this operation, the switches indicate the direction of transference, whereupon the woof reels redispose themselves into new pairs and repeat the tripartite twisting operation, after which the switches direct them back into their former association of couples, there being no traversing motion of any woof reels across the fabric to produce a squarely laid woof to form a close woof fabric such as weavers' harness. Conner could have gotten nothing from Winsor further than the mere suggestion of a possibly available mechanical movement. The in-
306 struments to be dealt with were different, the general conditions were different, the fabric was entirely different, the material to be dealt with was different, the direction of woof was different, there were intermediate warps, the path of reel travel was entirely different, and the period of transfer was entirely different, so that what was found in Winsor would not at all answer the purpose while it might contain useful and happy suggestions on which could be founded a development into something available. Mr. Wiles seems of the opinion that Conner has merely transferred Winsor's switching system to a machine for weaving diamond netting; that he has simply modified Winsor's system and applied it to a Davisson-Kitselman machine. In view of what I have just above pointed out as to the deficiencies of Winsor, in its adaptability to Kitselman conditions, I am inclined to think that Mr. Wiles is quite wrong and that Winsor could only be looked upon as furnishing a suggestion of a mechanical movement which bore no internal evidence of certain suitability for the radically new situation; and

that if this suggestion was followed up and finally developed into suitability for the radically new conditions, purposes, material, fabric and general mode of operation of fundamental machine, it could only be the result of invention.

Mr. Wiles refers to the Nesmith patent as illustrating, not a machine anticipating Conner, but as a machine having the same results. This is wrong, for it has heretofore been pointed out that the Conner machine would produce the Kitselman fencing, something the Nesmith machine was quite incapable of doing; and Conner in effecting transfers does it by transferring the woof reels themselves and, under the direction of the switches, by the simple rotation of the twisters themselves, while in Nesmith the transfers of wires are effected by attacking the wires direct by means of wedges which bodily force them from the slots of one twister into the slots of another twister, the twisters themselves taking no part whatever in the transference, and the machines being otherwise unlike in their mode of handling the wires, and their relative simplicity and compactness and their mode of operation.

It would not seem to me that there was anything in the
307 prior art imposing qualifications or limitations on the Conner invention as referred to in the claims thereof in suit.

The Pope patent in suit.

In the Davisson, Kitselman and Conner patents the hollow spindles were rotary spindles, their outreaching forward ends, projecting into the twisting zone, being subject to side strains from the woof wires pulling sidewise upon the warp wires running through the spindles, and the spindles, if unsupported at their forward ends, being liable to run out of true, as the mechanics call it, if not accurately constructed or very closely fitted in the bearings in which they turned. In Fig. 1 of the Davisson patent notice that the front end of the spindles, notwithstanding they are kept well back out of the twisting zone, project far forward in an unsupported condition. They are rotary spindles and their nearest support is found at bearings of rotation where a certain degree of looseness must be had in order to permit of proper freedom of rotary motion. Kitselman and Conner provided, in some measure, for reinforcing support at the front ends of their rotary spindles, both following Kitselman's plan of projecting the spindles clear forward into the plane of twisting. In doing this, both Kitselman and Conner lost the advantage of the free outreaching system of Davisson which left his reels and reel-carriers in position for ready accessibility. Let it be remembered that the woof wire is on these reels which require frequent replenishing. Davisson's reels were free and open to the eye and hand at the direct front, being in fact far forward of the front end of the spindles. Kitselman and Conner projected the spindles, and in giving some support to their front ends they lost something of the merit of Davisson's frontally accessible reels. Pope combines the advantages of Davisson's frontally accessible reels with Kitselman's forwardly projecting spindles and he avoids any wabbling tendency of the front ends of the spindles by making the spindles non-rotary

and causing them to furnish support for the central rotators of the twisters. This step at once introduced peculiar simplicity, stiffness, cheapness and accessibility into field machines for making
308 netting. The intergeared system of twisters, and the three-part twisters, and the exclusively transverse system of Kitselman were retained. In Fig. 3 of Pope's drawings, A is the upright constituting the frame of the field machine; E indicates the hollow spindles with their heels secured rigidly in the upright, their forward ends projecting out rigidly into the plane of twisting. G indicates the intergeared rotators which are to drive the twisters, these gears running loose on the rear portions of the rigid hollow spindles. I and L indicate the reel-carriers which project out boldly from the faces of the gears, the heels of these reel-carriers engaging within the face of the gears so that they are carried and turned by the gears. The hand-transfer system of Kitselman is adopted, hand-shifters being provided to slide the reel-carriers from one gear to another. It will be observed that the reels and reel-carriers form outreaching structures, like Davisson's, and similarly present themselves accessible to the eye and hand of the operator. The spindle also projects into this frontal plane of twisting, but it is a rigid member, giving support to other parts, and giving rigid support to the transversely strained warp wires without imposing any rotary chafing action upon that wire.

Referring to the first claim of the Pope patent: I understand the claim to refer to a field machine in which the upright frame piece bears rigid, hollow spindles projecting forwardly therefrom; intergeared wheels turning on the rear portions of such spindles; spool-carriers projecting forward from the faces of the wheels; tongues and grooves, or equivalent devices separably uniting the heels of the spool-carriers to the gears; and transfer devices for shifting the spool-carriers from one gear to another. In Davisson, Kitselman, and Conner the twisters were driven by gears and the cross-heads were separate from but in rigid driving connection with the gears, while in Conner the cross-heads were formed directly upon the gears themselves so that the gears serve not only in turning the twisters, but in carrying and forming the cross-heads by means of which the reel-carriers were carried and rotated.

Referring to claim 9: The claim would appear to refer to a similar structure, but regardless of whether or not the gears di-
309 rectly intermember, thus contemplating, perhaps, the Davisson system of driving the gears simultaneously by means of a rack, or possibly contemplating twister wheels having no teeth but arranged to be properly rotated by other suitable transmitting mechanism. And the claim would appear not to be limited to spindles secured to the upright by their heel ends, thus perhaps contemplating the possibility of extending them through and beyond the upright and into heel engagement with another supporting member at the rear of the upright. For instance, it is to be observed that Kitselman, having hollow spindles, extends them clear through the upright and beyond, and into supporting engagement with a rear upright member, thus giving increased stability to the spindles.

Regarding claim 10, it would appear that the claim refers to the same subject-matter as the ninth claim, being, however, expressly limited to the support of the spindles by their heel ends in the upright.

Mr. Wiles does not appear to have found any one patent meeting the conditions of the claims, but he doubts the display of invention in view of the prior art. He does not seem to have appreciated the merit of Davisson's outreaching system of twisters, or the loss of some of that merit in the Kitselman and Conner machines, or the apparent difficulty of reconciling the merits of Davisson's outreaching twisters, with the changed conditions brought about by Kitselman and Conner. He states that stationary spindles were not new in machinery. This is quite true, for wagon wheels have been universally mounted on non-rotary spindles. Non-rotary spindles will also be found about numerous classes of machines dealing with wire, but never under the conditions imposed by the Davisson machine. For instance, in the manufacture of barbed wire, a straight wire or a pair of them have a single wire barb twisted about them. Machines of this class are found in the Ayres & Becker patent No. 235,331; Bates' patent No. 357,653; and Brainard patent No. 277,451, referred to by Mr. Wiles as illustrating stationary spindles. But in those machines the spindles are no more suggestive of adaptability
310 to the Davisson system of wire working than are the spindles of an ordinary buggy, for they carry no reels and deal with no shifting side sections.

So, also, in the old field picket-fence machines, stationary spindles could be found, as indicated by Mr. Wiles, but it is to be remembered that these machines carried no reels and had no three-part twisters or sliding sections, or anything of that kind. They were no more suggestive than the buggy wheel on its stationary spindle.

Mr. Wiles refers to the Conner patent, and to the Kitselman patent, referring to the latter as the nearest approach to an anticipation of Pope, but it seems to me that in doing so it would have been well to call attention to the fact that the modifications and changed conditions brought about in the Davisson machine by those very patents were the modifications and conditions which suppressed the outreaching system of Davisson and seemed inconsistent with stationary spindles.

Winsor's patent No. 306,306 is referred to as an example of a spool-holder supported by its heel only as in Pope. In this patent the spool-holder is a spindle on which is mounted the spool of thread forming the woof and it is subject to no forward pulling strain, and it is not carried by the gears or central portions of the rotating mechanism and no two of them ever require to twirl about a warp. There is no scheme of carrying reel frames directly by their rotating gears.

The Sedgwick patents are referred to by Mr. Wiles as examples of upstanding reel-carriers. But he did not point out the fact that these Sedgwick machines did not have reels in the twisting field or engaged at all in the twisting, but that they were far to the rear and concerned only with the twist-preventing mechanism and that they

were on no gears and went around no spindles and had no association with spindles or gears.

Morgan's patent No. 432,951 is referred to. It has rotary spindles instead of stationary ones. It has not woof reels with their axes at right angles to the axes of the twisters; it has not spindles projecting forward beyond the heels of the reel-carriers; and it has not reel-carriers dependent for support solely upon the rotators which
311 move them in their orbital paths, but, on the contrary, it has reel-carriers of a somewhat complicated character engaging in front of and behind the upright of the frame of the machine and supported thereby, the rotators having only the office of turning them in their orbits.

I do not recognize anything in the prior art as detracting from the invention displayed by Pope in adapting a rigid non-rotary spindle to a Davisson-Kitselman machine under the almost forbidden conditions apparently imposed by both Davisson and Kitselman, and securing to the fullest extent the merits of Davisson's outreaching overhanging system of reels in conjunction with the frontally extended central spindles of Kitselman, at the same time securing a simpler and more rigid construction than either. The prior art would not seem to me to have effect in materially limiting or qualifying the invention of Pope as recited in the claims referred to of the Pope patent.

Adjourned until Monday morning, January 30, 1899, at 10 o'clock.

JANUARY 30, 1899—10 o'clock a. m.

Met pursuant to adjournment; present: same as before.

Examination of JAMES W. SEE continued:

Q. 8. I call your attention to that part of Mr. Wiles' deposition in which he undertakes to distinguish between the subject-matter of the claims here in suit and defendants' machine, and ask you whether or not, in your opinion, the distinctions which he mentions are substantial and material, so far as those claims, respectively, are concerned, and whether or not defendants' machine embodies the subject-matter of those claims as you understand them and as you have interpreted and understood them in your deposition, asking you to give your reasons for such opinions as you express.

By Mr. BANNING: The question is objected to as calling for testimony at least in great measure, on the question of infringement, which should have been taken, if at all, in the testimony-in-chief.

A. In my opinion the distinctions to which Mr. Wiles has
312 referred are not substantial or material, and in my opinion defendants' machine embodies the subject-matter of the claims sued on.

Defendants' machine is unquestionably a netting loom and is unquestionably a netting loom of the Davisson type, of the type radically distinguishable from netting looms of the art prior to Davisson, for it has its woof reels mounted right in the twisting zone

where they themselves form the twisters, the gears for rotating them being to the rear of them, there being no rear woof reels and fatal rear twisting conditions and necessary rear twist-preventing mechanism, as was found in all netting machines prior to Davisson. And the spindles of defendants' machine are all hollow and adapted for and obviously intended for and, as I understand, always used for carrying intermediate warp wires, the machine thus being capable of having a given twister deal with three wires simultaneously so as to intertwist two woof wires together and twist both of them around an intermediate warp wire. It would appear clear that defendants' machine was founded on the teachings of the Davisson patent, and that nothing in the art prior to Davisson contained teachings on which it could have been founded. Defendants' machine is a Davisson machine.

Defendants' machine is a portable field machine for making netting fences *in situ*, and for making the Kitselman fences *in situ*. It embodies improvements wrought by Kitselman upon the Davisson machine adapting the Davisson machine to such use. It extends the front ends of the hollow spindles forwardly into the twisting zone, into the vertical plane of the eyes of the woof twisters formed by the reel-carriers. It employs three-part twisters, involving a central section for carrying the warp wire and rotating the side sections, the central section having a fixed position, and shifting side sections transferring from twister to twister by transverse motion only. As a preliminary to the shifting of side sections, the cross-heads or carrying members of the twisters are brought into alignment or register, and this is accomplished by angular motion only of the central sections of the twisters, and by means solely of the simple mechanism which is employed in giving the twisters their regular rotary
313 twisting motion. The twisters are so far separated from each other that their orbitally moving woof reels will not interfere with each other, and the entire series of twisters is rotated, both in performing the twists and producing conditions essential to shifting, by simple spur gears fast on the central portions of the twisters and directly intergearing with each other. Mechanism is provided for the shifting of the side sections from one central section to another without involving longitudinal motion of the central sections. Defendants' machine thus appears to embody improvements superposed by Kitselman upon the Davisson machine to adapt it to portable and field use in the weaving of netting and Kitselman fencing.

And in defendants' machine the shifting of the side sections is effected exclusively by the action of the rotary central sections of the twisters, direction and time of twisting being controlled by suitable switches added for the purpose. It would therefore appear that defendants' machine embodied improvements superposed by Conner upon the Davisson-Kitselman machines.

Defendants' machine has the series of non-rotary hollow spindles projecting rigidly forward from the upright and supported by rigid engagement of their heels with the upright; and on these spindles are loosely mounted the intermembering spur gears forming the transmitting train of the machine and forming the central portions

of the twisters; and the cross-heads or reel drivers and carriers of the system are formed directly on the faces of these gears; and the reel-carriers are of outreaching, overhanging disposition, mounted directly in front of these gears and directly connected therewith by having their heels separably engaging the fronts of the gears so as to permit of the shifting of the reels from one gear to another. Defendants' machine therefore appears to embody improvements superposed by Pope upon the Davisson-Kitselman machine.

Regarding distinctions which Mr. Wiles considers discoverable: Mr. Wiles thinks defendants' machine and Davisson's are radically different "except in so far as they both embody the broad principle of construction and operation of the Nesmith machine." I
314 think it should be apparent that defendants' machine and the Davisson machine are alike in the very fact that they both similarly depart from the very principle of construction and mode of operation of machines of the Nesmith class, defendants' machine and the Davisson machine falling into a class representing an abandonment of about everything found in the Nesmith class of machines, except woof reels, and rotary motion of wire to produce twisting.

Mr. Wiles considers that defendants' machine has no spindles in the sense of the Davisson patent. He finds defendants' spindles to be rigid and non-rotary, according to the Pope patent, while in Davisson's machine they are rotary. He considers defendants' fixed spindles as frame elements, rather than twister elements, and thinks the same results might be accomplished by rearwardly projecting hubs on the gears, thus likening the gears to the gears of Nesmith. But it is a mistake, I think, to look upon these spindles merely as frame elements. They are elements essential in the mounting and rotation of the rotators of the twisters, of the cross-heads which carry the woof reels around in their orbits. The purpose of Davisson's spindles is to effect proper association between the driving mechanism of the machine and the orbitally moving woof reels, and between the several sets of woof reels. The presence of rotary motion involves a journal and a bearing, and either may have the rotary motion while the other member is fixed, as has been long recognized in the common arts. In defendants' machine there is at each twister necessarily a motion of rotation, and there is at each twister a journal and a bearing to permit of this motion. In the Davisson machine the bearing is stationary and the journal rotates, while in defendants' machine the journal is stationary and the bearing rotates, without in any manner or degree modifying the qualities of the rotary motion essential to be given to the cross-heads which carry the woof reels. At the center of each of defendants' gears is a hub forming a rotary bearing and turning upon a stationary journal, and these hubs, these rotary hubs, might be looked upon as rotary spindles, being the rotary parts nearest the axis of rotation and serving in giving support and axial guidance and control to the essentially rotating parts of the system, namely,
315 the cross-heads which carry the woof reels. I should say that defendants' machine was a Davisson machine involving

precisely the same necessities for rotary motion and providing support and guidance for that rotary motion by substantially the same means, namely, a journal and bearing, one fixed and the other rotary, and that the full rotary office of Davisson's spindles was found in corresponding rotary members in defendants' gears, these rotary members being hollow or provided with axial passages.

Mr. Wiles distinguishes between the spool-carriers of Davisson and the spool-carriers of defendants' machine, on a fancied line of "a difference of principle of their operation." There is no such distinction. In each case the reels are spools turning on their axes; spools mounted in front of the driving gear; spools with their axes at right angles to the axes of twisting motion. And in each case the reel-carriers are structures supporting the pivots for these reels. And in each case the reel-carriers serve in supporting these reel pivots in temporary union with one or another of the twisters and in carrying those pivots and their reels from one to another of the twisters. And in each case the reel-carriers surround and partially enclose the reels. And in each case the reel-carriers have frontal eyes in the twisting plane through which pass the woof wires from the reels. In each case the reel-carriers perform the twisting of the woof wires about themselves and about the warp wires. In each case the reel-carriers have the same orbital motions in performing the twists, and the same motions of transfer from one twister to another. There is no difference in the principle of construction or operation of the reel-carriers, as reel-carriers, in the two machines.

Mr. Wiles considers the two machines differentiated by reason of the difference in the manner of shifting the reel-carriers. But the result of the two systems is the same, a given reel or pair of reels being carried in an orbit by the cross-head of the twister until the proper twisting is completed, after which the reels leave this cross-head and move bodily to the cross-heads of contiguous twisters where they perform a similar twisting operation under new conditions of couplings of reels. In the Davisson machine there is moving mechanism of transfer to bring about the transfer of reels
316 from one twister to another, and Mr. Wiles thinks defendants' machine is totally void of transfer mechanism. Defendants' machine has transfer mechanism involving the rotary gears and also involving special movable switches to direct and control the transfer, as will be later explained. That defendants' machine accomplishes the transfer of reels by transverse movement only, and by the utilization of the rotary motion of the driving gears, is due to the fact that Kitselman and Conner have been drawn upon.

Mr. Wiles expresses the opinion that the Davisson patent is not high in the art, and that defendants' machine is alike to it only in old respects. This I think utterly erroneous, and for reasons which I think have been sufficiently given, reasons inevitably leading to the conclusion that Davisson's departure from the prior art was as radical as anything of which any art gives us an example. The likeness between the Davisson machine and machines of the prior art is to be found entirely in the mere fact that wire netting is to be produced by twisting action; after that all similarity ceases.

Regarding the Kitselman patent, Mr. Wiles has founded his distinctions between the defendants' machine and the patent upon his understanding of the prior art and, as heretofore explained, his apprehension of that art appears erroneous. I do not think I need to repeat what I have heretofore said on this subject in answer to the previous question. Mr. Wiles, for instance, expresses the opinion that Kitselman's twisters are more like Nesmith's than like defendants'. Nesmith's twisters are slotted gears far in front of their reels, the reels doing no twisting, and their location calling for rear twist-preventing mechanism. Kitselman's twisters and defendants' twisters, on the other hand, involve no slotted gears; the reels and their carriers themselves form the twisters; they are clear to the front in the field of twisting; and there is no troublesome rear.

Mr. Wiles appears to think that the Kitselman three-part twisters essentially involve a rotary spindle in the central part. I think he quite overlooks the fact that the rotation of the central part of the twister has nothing to do with the performance of that central
317 part in carrying the warp wire, and that rotation is an essential attribute only of the cross-head which drives the side sections in their orbital paths. This will, I think, be readily appreciated if we turn to Fig. 4 of the Kitselman drawings and assume a warp wire passing through, say, the upper twister. The central portion of that twister turns and, consequently, turns on the warp wire passing through it, the front face of this central portion supporting the warp wire in the plane of twisting. But the rotation of this central portion has not a thing to do with the support of this wire. For instance, assume a tube slipped over the rear portion of the wire and pushed forward through the twister so as to form a non-rotary lining therefor. The twister would not then rotate against the wire, and the wire would be in contact only with the stationary tube, but every office of the central portion of the twister in supporting the warp wire would be performed as fully as before and, indeed, better, for there would be no rotary chafing of the wire. Therefore, the spindle of the twister in its performance in connection with the warp wire involves no necessity for rotation. The central section of the twister drives the side sections in their orbits. At the rear of the spindle is the cross-head l^1, which is engaged by and drives the side sections. At the front of the spindle is a similar cross-head giving supplemental transmission and support for the side sections. Now, cut the spindle off just forward of the rear cross-head and remove the cut-off portion. The side sections will be driven as before, it thus becoming apparent that the driving of the side sections in their orbits is not only not dependent on rotation of these projecting spindles, but is not dependent on their presence. But proper support of the side sections so that they may be properly moved in their orbits by the central sections would appear to be dependent on frontal support for the side sections, as is the case also in defendants' machine in which the forward portions of the side sections have supporting engagement with the extreme forward end of the spindle of the central sections. The fact that defendants'

spindles are non-rotary is traceable directly to the fact that the Pope patent has been drawn upon.

Defendants' machine is founded on the purely transverse transfer of the side sections as in Kitselman, but Mr. Wiles appears
318 to be of the opinion that defendants' machine is differentiated from the Kitselman patent by the fact that Kitselman's specific shifting mechanism had not also been adopted. The Kitselman claims in suit do not limit themselves to the Kitselman specific shifting mechanism, and it would appear that defendants' machine, in adopting the Kitselman system of shifting, by transverse motion only, had departed from Kitselman's shifters working by hand lever and had adopted the Conner system of shifting by the direct rotary action of the gears under the controlling direction of supplemental switches.

It appears clear that defendants' machine has the three-part twisters of Kitselman arranged to deal at one time with three wires directly in the twisting field; that the shifting was effected after the system of Kitselman, by transverse motion only; that the central sections of the twisters give the orbital motion to the side sections; that the conditions precedent for transfer of side sections are brought about exclusively by the operation of the rotary motion only of the twisters; and that the central portions of the twisters are directly intergeared, defendants' machine thus being founded on the Davisson patent and embodying also features of improvement invented by Kitselman.

Regarding the Conner patent: Mr. Wiles, as with the Kitselman patent, appears to found most of his distinctions upon a misapprehension of the machines of the prior art. For instance, he refers to the Nesmith and Winsor machines. But it seems that the more they are studied the further we are led from machines of the class in controversy. Mr. Wiles considers that Conner has taken the Kitselman machine and substituted therein the transfer mechanism of Winsor. I have heretofore reviewed this matter in answering a previous question, and neither Conner nor defendant have adopted or could employ the Winsor transfer mechanism.

Mr. Wiles thinks defendants' machine distinguished from the Conner claims because Conner involves switches and defendants' machine has "no switching or shifting mechanism whatever." Mr. Wiles has, I fear, failed to understand defendants' machine. It has switches and will not operate without switches. These switches are carried by the gears themselves.
319 Notice in the face of each of defendants' gears a pair of round buttons. These are the heads of reciprocating spring switch-pins. Operate the machine or the models to produce the transfer of the side sections and notice that at each transfer the appropriate switch-pins move out and then snap in. At the instant of intended transfer hold the proper switch-pin outward and prevent its retraction, and the transfer will not take place, these switch-pins being essential to the operation. Remove these switch-pins and no transfers could be effected. Defendants' machine has switches, and switches are essential to its operation.

Mr. Wiles appears to think the notches in the disks in defendants' machine are without office and, in support of this view, he has produced the model called the mutilated model, with some of the disks cut away as chords of a circle so as to remove the notches from those disks, the model appearing to work all right in the absence of the notches in those disks. But it is to be observed that in the mutilated model the hubs of the side sections still find a bearing on the chords of the disks, and within the rear of these mutilated disks there are side-engaging elements taking hold of the side sections so that they are properly held and carried by the central sections. And it is to be also observed that in the mutilated model the disks at the outer ends of the side sections still retain their notches engaging the outer end of the central section or spindle, the side sections thus getting support from the notched system. And, aside from all this, the conditions of strain in use are absent. When defendants' machine is at work there are heavy inward strains brought upon the side sections of the twisters, strains which must be met, and which if not met would interfere with the practical operation of the machine. I am of the opinion that defendants' machine, if constructed like the mutilated model, would present fatal embarrassments when being used under practical conditions. The machine is somewhat troublesome as it is, as can be judged by operating either it or one of the little models. Everything may be moving along nicely and the proper transfers seem to be taking place when all of a sudden, owing to some little inadvertent manipulation, a transfer miscarries and one or more side sections fall out of the machine to the floor or the ground. Indeed, the tyro will need to have his wits about him to keep these side sections in the machine. In defendants' machines which I have lately seen there has been added to the upright a vertical notched member extending up and down along outside the series of reel-carriers and obviously intended to prevent this exasperating dropping out of the side sections. Defendants' machine would appear to be a Davisson-Kitselman machine embodying the system of Conner whereby switches direct the transfer and whereby the transfer, under the direction of the switches, are effected entirely by the rotation of the twisters, the path of transfer in defendants' machine being the same as the path of transfer in the Conner patent.

Regarding the Pope patent: Mr. Wiles appears to consider straight sliding transfer as essential in considering the Pope claims and also considers the specific tongue-and-groove arrangement of Pope as essential. I do not so look upon the matter. So far as sliding is concerned its object is merely to transverse a woof reel from one twister to another, and precisely the same result in this respect is arrived at whether the transverse movement of the side sections be in straight lines, as in Davisson, Kitselman, and Pope, or in sinusoidal line, as in Conner and defendant. So far as the specific tongue-and-groove connection between the reel-carriers and the gears is concerned, the only object is to provide for temporary union between the gears and the reel-carriers so that the gears may for the time being turn the reel-carriers in their orbits, the temporary

character of the union permitting the reel-carriers to be associated first with one and then with another twister. The object after all is to have a rotary cross-head and outreaching reel-carriers temporarily united to and driven thereby and shiftable therefrom. The tongue-and-groove of Pope has receiving and retaining qualities. The receiving quality lies in the fact that the gear has a recess and the reel-carrier has a projecting feature adapted to dispose itself within such recess. The retaining quality is due to the fact that the projecting member of the reel-carrier, in engaging the recess of the gear, finds position behind a wall of the recess, so as to prevent frontal displacement, the reel-carriers thus being united to the gears by heel engagement only. And
321 in defendants' machine the reel-carriers are united to the gears by heel engagement only, and they have projections engaging recesses in the gears and these projections, in entering the recesses engage behind the walls of the recesses so as to prevent frontal displacement. Defendants' machine unquestionably presents the conditions of outreaching spindles fixed by their heels against rotation in the upright of the machine; gears engaging with each other and loosely running on the rear portions of these stationary hollow spindles; recesses formed at the front of the gears; reel-carriers disposed in front of the gears and carrying woof reels; projections on the heels of these reel-carriers and disposed within the recesses in the gears; projections of these entering members engaging behind walls of the recesses in the gears; the prevention of frontal displacement of the reel-carriers; the temporary union between reel-carriers and gears; and transfer devices for effecting transposition of the reel-carriers.

Recess until 2 o'clock p. m.

After recess.

Q. 9. What opportunities have you had of becoming familiar with practice in the Patent Office of the United States?

By Mr. BANNING: Question objected to as being irrelevant, immaterial and incompetent.

A. I have solicited several hundred patents, acting as attorney for inventors, and I have also prosecuted quite a number of applications pertaining to inventions of my own.

Q. 10. Mr. Wiles appears to represent that where applications are amended after rejection of certain claims, either by rewriting those claims in different terms or by otherwise inserting amendments therein, the applicant thereby admits that whatever was embraced in such claims before such amendment is admitted to be old. How far, if at all, has your observation and experience and the practice of the Patent Office coincided with this representation, and what have you found to be the usual purpose and significance of such amendments? Please explain so far as you think pertinent.

322 By Mr. BANNING: The question is objected to as immaterial, incompetent and irrelevant, it being for the court to determine the effect that is to be given to the actions of the Patent Office, and not a matter for the opinion of the witness.

A. Aside from my own experience as a solicitor, I have quite an extensive acquaintance with other solicitors, with many of them, and, in addition, I have in the course of years, had occasion to review the file-wrappers and contents of a great many applications. My understanding of the matter in question does not at all agree with that expressed by Mr. Wiles.

The question of the amendment of a claim is quite often merely one of expediency. A number of claims may be presented and the examiner may look with favor on some and may reject others. The solicitor or the inventor may at once possibly detect an error in the examiner's position. Appeals can, of course, be taken, but this involves cost and delay, and the inventor may want his patent. It may be determined that a given rejected claim is not essentially different in its protective scope from a claim which has been allowed or from a claim, which it is known, from the tenor of the examiner's letter, that he will allow. Under such circumstances, it may be determined to drop a rejected claim or to amend it into a form which it is known or believed will satisfy the examiner. Very often there will be found in the files of applications a letter of advice from the attorney to the Patent Office, transmitting amendments and containing such an expression as "the cla'm has been amended out of deference to the examiner and with a view to expediting the application, but in the full belief that the claim in its original form was allowable." Again such an expression is frequently found as "claim so and so has been stricken out, not with any doubt as to the real allowability of it in view of the references on which it was rejected, but with the belief that the subject-matter of it is satisfactorily cared for in claims which have been allowed." It has very often happened in my own personal experience, that an examiner has brought up an objection to a claim, by reference or otherwise, which objection I felt

323 thoroughly satisfied was not well grounded, and could be overcome by argument or appeal; but, having gathered the examiner's position from his letter, and being instructed to expedite the case, I have amended the claim, or claims, with a view to securing almost certain favorable action, the amendment perhaps having no material effect whatever upon the scope of the claim or claims or, perhaps, having some limiting effect which, however, might not be objectionable in view of other claims already allowed. The personality of the examiner has much to do with the matter, and so also have the desire and condition of the inventor. It is often a matter of expedience. For instance, I have filed an application with a broad and comprehensive claim, supplemented by minor narrower claims, and have had the broad claim allowed and minor claims objected to or rejected. Patent applications are acted on in the first instance by assistant examiners often somewhat callow and often anxious to make some kind of a record. The

experienced solicitor will, unless he has carte-blanche as to time and expense, be very careful about which way he rubs the hair of these gentlemen, for he is liable to be in contact with them frequently in the future in other cases. It is not my experience or belief that amendments founded on objections involve admissions that the objections were well grounded.

Q. 10. In a fence having the longitudinal wires extending through the diamond after the manner of what you have termed the Kitselman fence, what, if any, opportunity is allowed for the contraction and expansion incident to variations of temperature other than by the straining of the metal composing the wire?

A. If a Kitselman fence was erected in warm weather with extremely taut warp wire, the contraction in cold weather would bring strains on those wires, which strains would have to be satisfied by the stretching of the wire or by the yielding of the end posts of the fence. It is, of course, desirable to have the fence as trim and taut as feasible, but it is not desirable to have the wires unduly strained within themselves or unduly straining on their posts. No wire in the world disposed horizontally was ever pulled straight, but, on the contrary, no matter how straight it might look, it sags in a
324 catenary curve. Catenary curves are present in all horizontal wires, from the cables of the suspension bridge to the straightest-looking telegraph wire.

I understand it to be the practice of complainants, in building Kitselman fencing with their machines, to not strain the warp wires tightly, but, on the other hand, to leave them so slack that on a long stretch of fencing, when the machine begins at the initial post all the wires will touch the ground between the machine and the terminal post. This would mean lots of slack in the wire and would certainly mean undesired slack in a completed fence if it was not taken care of. But, as the weaving progresses, this slack all becomes taken up until the completed panel appears as a tight fence. Looking around to see where all this slack has gone to, it is to be observed that each individual one of the multitude of longitudinal units represented each by the length of a diamond takes up a part of the slack, these units containing slight bends or deflections. The warp wires are thus endowed with yielding qualities, and the lengthwise tautness of the general fence structure is due to the fact that these warp wires have bound to them the intertwisted woof wires leading off in four directions from the diamond intersections, these woof wires thus forming a multitude of diagonal stays having the effect of keeping the warp wires and the entire fabric under the desired longitudinal strain and distributing the strain of every warp wire among all of the other warp wires.

Q. 11. Does, or does not, the model which you have referred to as the "Nesmith certified model" correspond to the drawings of the Nesmith patent in respect to such parts as are present in this model?

A. The certified Nesmith model corresponds accurately, in all of its parts found present, with what is shown in the Nesmith drawings and described in the Nesmith specification, with one exception

which, however, is easily accounted for. In the certified model notice the shaft with its coupling sticking outward from the feeding end of the machine. This shaft ought to project toward the twister part of the machine; in other words, the shaft ought to be turned end for end in the model, as could be done in two minutes. I have judged that this shaft became separated from the other parts
325 during the fire and that in replacing it in the feeder part of the machine, where it belonged, it was inadvertently put in wrong end to, the error not being discovered, perhaps, because the shaft of the twister to which the shaft in question was to be coupled was entirely gone from the wreck.

The model last referred to is here offered in evidence, and marked "Complainants' Exhibit Nesmith Certified Model," the Patent Office certificate attached to what has been termed the "feed part" of the machine being as follows:

"DEPARTMENT OF THE INTERIOR,
"UNITED STATES PATENT OFFICE.

"To all persons to whom these presents shall come, Greeting: This is to certify that all that now remains in the archives of the Patent Office of the model filed in the matter of the letters patent granted John Nesmith, April 4, 1854, number 10,743, for improvement in machine for making wire netting, is comprised in two separate parts, one of said parts containing all that remains showing that portion of the machine termed in the specification of said patent the 'feeder,' and the other of said parts containing all that remains showing that portion of the machine termed in the specification of said patent the 'twister;' that the annexed is a duplicate of the part containing what remains of the 'feeder' as it now appears, the original having passed through the Patent Office fire of September 24, 1877.

"In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the city of
[SEAL.] Washington this 18th day of January, in the year of our Lord one thousand, eight hundred and ninety-nine and of the Independence of the United States of America the one hundred and twenty-third.

"C. H. DUELL,
"*Commissioner of Patents.*

"(10c. documentary stamp.)"

326 The certificate attached to the twister end being the same except where the word "feeder" last occurs in the foregoing, the word "twister" is substituted, and the date is the 20th day of January, 1899.

In lieu of encumbering the record with the Sedgwick catalogue referred to by the witness, it is admitted by counsel for complainants and defendants, respectively, that the catalogue to which the witness referred illustrated and advertised wire fence corresponding to figures 1 and 2 of the illustrations contained in answer 6 of this witness' deposition.

End of direct examination.

Cross-examination by Mr. BANNING:

X Q. 12. Is there any difference in the woven-wire fabric shown in Fig. 1 of the Nesmith patent and Fig. 1 of the Davisson patent?

A. They are substantially alike.

X Q. 13. Is there any difference between the woven-wire fabric shown in Fig. 1 of the Nesmith patent and the woven-wire fabrics shown in Figs. 1, 2, 8, 9 and 21 of the Kitselman patent?

A. Substantially none, the Kitselman patent illustrating the ordinary as well as the improved fabric.

X Q. 14. Do not those figures illustrate styles of fabric which Kitselman's patent describes as made on his machine?

A. Certainly.

X Q. 15. Is there any difference between the style of woven-wire fabric shown in Fig. 1 of the Nesmith patent and figure 2 of the Conner patent?

A. No, with the qualification, however, which may be applied also to Davisson and Kitselman when compared with Nesmith, that the fabric shown in the Nesmith patent with its border wires has, when provided with those wires, a fixed width in relation to the machine in which it was woven, or, in other words, the fabric can have but one width and that is the maximum working width of the machine. In the Davisson, Kitselman and Conner machines the fabric, while itself the same, has a width not thus controlled by the machine in which it was made, for out of the same machine can come wide and narrow fabrics with border wires at each end.

327 X Q. 16. Then, the Nesmith machine and the Davisson, Kitselman and Conner machines all have a capacity to weave the same fabric—the Nesmith fabric—is not this correct?

A. It is correct as regards that fabric.

X Q. 17. The Nesmith machine consists of two machines or mechanisms termed, respectively, the "feeder" and the "twister," as you have pointed out. If we remove the twister, there is left an organized machine capable of weaving the Nesmith fabric, is there not?

A. There is left a fragment of the Nesmith machine, a fragment designed for the prevention of twists and for the feeding of wires in parallel disposition. I do not know that this segregated fragment would be capable of weaving the Nesmith fabric. It was certainly not intended to do it, but was intended to do distinctly different work, to wit, stand behind and guard the machine that did do the work. But Nesmith's specification does not explain to us even how his feeding machine was intended to do its work, or how it was constructed, and his drawings are quite unsatisfying, and vital parts of the model were lost in the fire. It cannot be known that it will do anything, or that it was completely worked out for the intended Nesmith performance. The most favorable presumption is that it would do what Nesmith intended it should do, namely, serve as a feeder and stand guard behind the twister, and that it would not do what Nesmith provided his entire machine for doing. If the tail

end of Nesmith's machine ever had any such capacity as your question would suggest, it is quite evident that Nesmith, the creator and patentee of the machine, never discovered such capacity.

X Q. 18. I am not asking about what particular purpose Nesmith may have put it to or described it as applicable for, but I am asking whether the part called the "feeder" in the Nesmith machine does not constitute an organized mechanism capable of weaving diamond-mesh fence. Please give us your opinion as to this.

X Q. 19. Considering it in connection with its associations or relation to other parts, it certainly does not, for, when so associated and related, it was certainly incapable of twisting wires and was purposely designed for a distinctly opposite performance, to
328 wit, the prevention of the twisting of wires just in front of it or anywheres to the rear of the twisters of Nesmith's machine. Your question uses the term "organized." But it seems to me that the question also carries the essential implication of disorganization, Nesmith's weaving machine having been disorganized and your question concerning itself with one of the organs only.

X Q. 20. In order to perform the work that Nesmith assigned it was it not necessary that the parts of the feeder should operate simultaneously with the parts of the twister; that the wheels carrying the wires should make the same number of turns or revolutions, and that the wires should be shifted from one wheel to another simultaneously with their shifting in the twisters and that similar means should be employed for shifting them—in short, was it not necessary that the feeder should have substantially the same operation that the twister had, so far as the movements of its parts are concerned?

A. This appears correct when considered in connection with the rotation of gears, which must turn in unison, and with the side shifting of wires which, as I understand it, must be simultaneously attacked and shifted in the twister and in the feeder. But the wires shift a greater distance in the feeder than in the twister, all the wires, except the central one, converging somewhat from the feeder to the twister, as can be seen in Fig. 1. I have said nothing about this convergence before, desiring to avoid discussing the matter, but I should, perhaps, have stated that this convergence appears to introduce into the Nesmith machine a very serious and, it seems to me, a fatal condition, for it is past comprehension how he proposes to keep the outer woof wires under uniform tension or how he proposes to keep them from slipping sidewise out of the slots of the outer twisters. The matter is serious, and if he has any way of taking care of it it is not discoverable. I have stretched threads in the certified model, and found the constant tendency for the side woofs to get into trouble at each half turn of the twisters. I wished to avoid discussion of the matter because it was rather complex and would burden the record unnecessarily.

X Q. 21. In view of the fact that the slotted gears of the feeder rotated as did the slotted gears of the twister and that
329 the wires were shifted from the slot of one gear into the slot of the next adjacent gear, as they were shifted in the twister,

would not the feeder twist these wires into a diamond-mesh fabric—the diamonds being larger than those formed by the twister—if the twister were removed and the wires fastened or attached to stationary points so that they could not rotate except as rotated by the gears of the feeder?

A. Or, as I understand it, stop the Nesmith twister and let the feeder continue its motion, assuming proper distance between the two machines, and would not the feeder go on and beautifully weave up netting as well as the twister would, but with meshes somewhat larger? In view of the Nesmith patent, it is hard to conceive of this being possible. If the Nesmith patent was clear as to the mechanism and modus of his feeder, we might analyze the matter and form a conclusion, but his patent not being clear, we cannot analyze it on our own account, but are inevitably led to the conclusion that if we could understand Nesmith's feeder we would find something in it preclusive of any such result as is suggested by the question, for if Nesmith's feeder had any such capacity, what in the world was his double-barrelled machine all about? I cannot fall in with the idea of throwing away Nesmith's twister, the head and front of his machine, and then exalting the subordinate feeder to the position of supreme executive. In Nesmith's estimation his feeder may have been the keystone of the arch, but Nesmith wanted the arch, and not the keystone alone.

X Q. 22. Do you attach any importance to the size of the mesh used in weaving wire fabric when considering the question of invention, or is that, in your opinion, an immaterial circumstance?

A. Yes and no. There are limitations to the smallness of mesh which can be made on machines having the general mode of operation of those in suit, for the width of meshes must be sufficient for the passage of the woof reels. That is fundamental in the Davisson system, and construction on this principle could not be carried down to sizes suited for small meshes. When the weaving is done on machines constructed on the old system, of slotted or split twisting wheels, I do not see that they could not be made to deal with
330 the smallest meshes that would ever be wanted for any purpose, for fences or anything else. Briefly, machines on the old system had no limitations regarding size of mesh, while machines on the Davisson principle are not available with very small meshes.

X Q. 23. Within the limits of practical work, you regard it as important or material, so far as the question of invention is concerned, whether the mesh be woven of one size or another?

A. No, if by practical work you mean fabric intended for fences, or anything of that nature. But fine netting to fence out flies, or fly screening, would be another story, if machines on the Davisson principle were in view.

X Q. 24. Throughout your disposition you have used the word "warp" wires in the sense in which that word is used in the Nesmith patent—to indicate the longitudinal strands—have you not?

A. Broadly, yes, as indicating any longitudinal wires of the fabric, but in the narrower sense I have used it as applying to the intermediate longitudinal wires of the Kitselman fencing. In illustra-

tion, you might take a piece of Kitselman fencing and cut out or in some way get out the border wires and still have warp wires left and have a good fence left. But in simple netting, if you pull out the border wires you have no warp left, and the fabric would not be suitable for fencing.

X Q. 25. As I understand the Nesmith patent, the word "warp" wires is intended to designate the longitudinal strands arranged between the outside or border wires. Is not this your understanding and is not this the sense in which you have used the term "warp" wires?

A. Nesmith uses the term to designate his border wires, there being no longitudinal strands arranged between the border wires, and no provision for thus arranging them. The Nesmith patent appears to use the word "warp" only once, namely, in the sixth claim, where we find the expression "border or warp wires."

Adjourned to tomorrow morning at 10 o'clock.

331 JANUARY 31, 1899—10 o'clock a. m.

Met pursuant to adjournment; present: same as before.

Examination of JAMES W. SEE continued:

X Q. 26. What are the gears referred to in the Nesmith patent as J, E and X?

A. J indicates the twisters, forming the vital elements of the twisting machine and doing the entire twisting. They are slotted gears, with wires engaging the slots. X indicates the front gears of the feeding machine, similarly slotted, and, apparently, similarly carrying the wires in their slots, these gears turning in unison with twister gears J. E indicates the rear gears of the feeding machine. They turn also in unison with gears X and twister gears J. They are also said to be slotted to carry wires, as I take it, but I am not clear as to what wires go into the slots of these gears or what they go in there for. I do understand the mechanism for transferring the wires from slot to slot of these gears.

X Q. 27. As I understand, there are five of the gears J and five of the gears X and five of the gears E and that they are all lettered with these letters, respectively, in figure 1 of the drawings of the Nesmith patent. Is this correct?

A. It is correct, the machine being a five-wire machine involving fifteen slotted gears, all of which are lettered in Fig. 1.

X Q. 28. What is the office of the two movable planes *d d* described in the second column of the second page of the Nesmith specifications?

A. At the time the twisting takes place there is a tendency, at each twist, to produce a local distortion of the fabric, in other words, the wires just ahead of the twisting tend to spring around under the strains of twisting. Nesmith, to compensate for this, arranges a pair of clamping plates, one under and one over the wires just ahead of the point of twisting. These plates form a clamp opened and closed at the proper time by cams. When they are closed they hold the

entire width of the fabric firm just in advance of the twisting. This clamp is composed of the plates in question, the two planes
332 *d d*. In Fig. 1 these planes appear just ahead of the twisters, but they do not bear the letters of reference. In Fig. 2 they are letterd; in Fig. 3 they appear, but are not lettered, and in Fig. 1 one of them appears dissected out of the machine and laid alongside the feeder. In the original drawing, of which I have seen a certified copy, this fragment bears the legend explaining that it is a view of one of these planes. In preparing the drawings for photolithographic copies this legend has been omitted.

X Q. 29. Has the certified drawing to which you have just referred, of the Nesmith patent, been offered in evidence?

A. Not that I recollect, but I here produce it for your inspection, and to be offered in evidence by you, if you desire it.

X Q. 30. Is it not a fact that at the time of the issuance of the Nesmith patent in 1854 the drawings were not photolithographed and that in the case of these old patents new drawings have been made by the office draftsmen from which the photolithographing has been done?

A. Photolithographing had not then been discovered, and many of the old drawings were unsuited for photolithographic copying, therefore the Patent Office set draftsmen to work to reproduce old drawings in a form suited to being copied by the process.

X Q. 31. Is it not also a fact that the practice of printing the specifications for general distribution, as it were, so that any one can order and obtain a copy, was of much more modern origin than the date of the Nesmith patent?

A. Quite true.

X Q. 32. I notice that neither the tracing of the original drawings which you have produced nor the photolithograph copies attached to the printed specification show the gears J, E and X as perforated—neither the outside gears nor the intermediate ones. Is not this correct?

A. I think so, except that in Fig. 1 the border wires appear as passing axially through all the border gears, and the specification so describes them.

X Q. 33. Would the sixth claim of the Nesmith patent mean anything different from what it now does, in your opinion, if the words "or without," in the first and second lines, were omitted?

333 A. It is hard to tell what the claim might mean in either case, as it refers to matter not shown or described or understandable from what is shown or described. This defect in the claim is quite independent of the particular expression you refer to.

X Q. 34. Does not the statement in the sixth claim of the Nesmith patent that the feeding and twisting gears are claimed "with or without their centers perforated" leave the matter to the preference or pleasure of the constructor so that he can make them in the one way or the other, as he may prefer?

A. I have judged so, the border gears being perforated or not, according to whether or not the netting was to be provided with straight special border wires.

X Q. 35. The feeder and the twister of the Nesmith patent are entirely separate and distinct from each other and are only connected together by the shafts P and Q, which shafts are connected together by sleeves provided with set-screws. Is not this correct?

A. It is true that the two machines represent separate structures unified into a single structure only by the two transmitting shafts in question, and, in operation, by the wires on which both members operate.

X Q. 36. Did you ever see a Conner machine in operation?

A. Not just as set forth in the Conner patent, but I have seen machines involving the Conner system of transfer.

X Q. 37. Have you ever seen a feeder used in connection with the Conner machine or any other machine?

A. Not that I know of.

X Q. 38. When no feeder is used, is not the supply of wire which can be carried on the spools which are rotated around the warp or strand wires quite limited where the mesh is of an ordinary size for fencing fabric?

A. Comparatively so.

X Q. 39. If, however, a feeder be used, any desired quantity of wire can be carried on the spools of the feeder, so that the necessity of changing or replenishing is, to a large extent, done away with. Is not this correct?

A. Hardly, for much depends on the character of the feeder. For instance, take the Nesmith feeder, as Mr. Wiles under-
334 stands that feeder, and as it has been embodied in defendants' model of Nesmith's feeder; a feeder on that plan has the ordinary limitations as to the amount of woof wire which is available without replenishing.

X Q. 40. It is true, is it not, that with the use of a feeder of proper construction the necessity of frequent replenishment of woof wire can be largely operated or done away with?

A. No, not as I understand the possibilities. A feeder on the Sedgwick plan has certain advantages in this respect, as regards half the woof wires. Half of the woof wires are carried on stationary reels, which may be of unlimited size. But the other half of those wires are carried on orbitally moving reels, whose size is limited by the necessity for their moving in orbits without mutual interference.

X Q. 41. The only kind of a fabric that Nesmith illustrates or describes in this patent, so far as details are concerned, is that shown in figure 1—one with border wires—is not this correct?

A. It is.

X Q. 42. I believe you have insisted that the Whitehead machine shown in the British provisional specification of 1854 was inoperative for various reasons. One of these, as I understand you, was because the long spools on which the coil of wire was placed—the spools E—were so arranged as that they rotated in unison with the twisters. Is not this correct?

A. No, sir. The defect was that the spools were incapable of rotation at all. They could revolve in orbits, being carried around by

the split gears, but before any wire can be drawn from them they must be capable also of rotation, that is to say, of turning on their own axes. Go to any of the exhibit machines in this case, and, by any means, prevent one of the spools from turning on its axis, and you at once defeat the operation of the machine, for wire will be yielded up only when the spool can turn. Take a spool of thread, for instance, and there are but two ways of getting off the thread, one being to pull on the thread while the spool is free to turn, and the other being to carry the thread as circles off of the end of the spool while the spool remained stationary. Neither plan is possible in the Whitehead scheme, for the spools will not turn, and wire cannot be gotten off of their ends.

335 X Q. 43. I think, notwithstanding your answer, that there is a third way in which the thread could be got off of the spool, namely, by leaving the entire body of the thread coiled around the spool loose enough to rotate around the stationary spool. In this case the spool would not rotate nor would the thread be taken off in circles over its end, but the body of the thread would rotate around the spool as its end was drawn out. Now, if, as I understand the Whitehead machine, the coil of wire is free to turn or move around the spools E, would not the drawing of the ends of the wire past the little pulleys or idlers shown in plate 8 of the Whitehead drawings cause the coil of wire to rotate around the spools so that there would be no difficulty whatever in feeding the wire to the twisters? Is not this correct, if the wire coil around the spools is loose enough to turn or move around the same?

A. It is correct until you get to the "if." A coil on a cylinder hugs that cylinder when pulled upon. The heaviest kind of hoisting is done upon that very principle of the enormous grip resulting from a few bights or turns of rope around a capstan. Remember that a capstan is not a reel with its rope fastened to it and winding upon it, but that the rope simply passes the capstan, being given a few turns about it, or bights, as they are called, the rope winding up on the capstan in front and unwinding therefrom in the rear, the number of coils not increasing. A man at the rear, pulling on the rope with one hand, can produce sufficient friction on the capstan for the lifting of tons. And the plan you speak of would be quite out of the question in Whitehead's spools, for your plan assumes that the lower end of the wire is left loose or unattached to the spool or spindle. This end will make trouble. Whitehead does not explain how he fastens his wires, but the presumption is that his shoes B are for that purpose, as they accomplish no other purpose which a tenon directly on the end of the spindle would not accomplish.

X Q. 44. I believe another reason that you gave why the Whitehead machine would be inoperative was that when the shifting bars B', shown in figure 4, were moved longitudinally by the pinion X, there would be an instant locking occur between the teeth engaging the rack F. Is not this correct?

A. Quite correct.

336 X Q. 45. Would such locking occur if the rack F is fastened to or forms a part of the adjacent sliding bar B' so as to move in unison with it?

A. The locking to which I referred would not then occur, but you would have by this arrangement, locked a sliding bar and rack together, thus locking each of them against movement relative to the other, which is against the law of operation of the machine. To realize your plan, you would have to get up some sort of a locking arrangement which could be brought into action at certain times, and released at certain other times, and, further, you would have to go through all of the transmitting devices pertaining to the reciprocation of the rack and to the reciprocation of the slide-bar, and so arrange them that they would not interfere with the motions in unison which you propose. Whether or not this could be accomplished, is a question, and, even if accomplished, might not be better than worrying with the two handles at once. It might be possible for a deft-handed man, or for two men operating simultaneously, to work the two handles so that a shift could be accomplished, but it would be in no sense a practical operation or one to be thought of in connection with the actual use of the machine.

X Q. 46. If the rack F be moved by a stop, for instance, on the bar B^2 so as to move in unison with it and be left free to operate at other times, the locking that you referred to in your direct testimony as showing the inoperativeness of the Whitehead machine, would be obviated, would it not?

A. Such provision is not found in the Whitehead patent, and I can better answer your question after you show me some sort of an illustration or embodiment of the proposed arrangement.

X Q. 47. Do you find anything in the Whitehead specification which says that the rack F is to remain stationary while the bar B^2 is moved into shifting operation?

A. Nothing in the specification, one way or the other, and going to the drawings, it is seen that the operative mechanism of the rack holds it stationary, except when power is applied to that mechanism to move the rack.

X Q. 48. Referring to the second claim of the Davisson
337 patent, do you understand that the series of spindles called for are required to be hollow spindles, as in the third claim?

A. I do not.

X Q. 49. They may be solid spindles and still fall within the requirement of the second claim—is this your understanding?

A. Judging from the prior art, I think so.

X Q. 50. What are the bearings referred to in the second claim—what letter- of the drawings designate them?

A. The spindles have upper and lower bearings, the lower ones being sliding bearings marked B, best seen in Fig. 13, the upper ones being formed on the hubs of pinions *a*, or, to speak more properly, the journals are on the hubs of the pinions, the bearings being formed by plates *b*. The lower bearing B is a sliding bearing arranged to give the spindle its up and down advancing and retiring motion to bring it into alignment, the spindle, during such motion, sliding through its gear *a*. Each spindle has, therefore, a sliding bearing and a non-sliding bearing.

X Q. 51. Why does the third claim call for two or more hollow spindles adapted to admit the passage of wires?

A. The drawings and descriptions make all of the spindles hollow. The second claim ignores these hollows, thus comprehending a Davisson machine regardless of whether or not it can deal with special border wires or other warp wires. The third claim calls for two or more of the spindles being hollow, thus comprehending a machine capable of dealing with two or more special warp wires or with special border warp wires in narrow as well as in wide fabrics.

X Q. 52. If we take the Davisson machine with all of its spindles hollow, as illustrated and described in his drawings and specifications, and pass longitudinal strands or border and warp wires through them, the fabric that would result from weaving with the spindles thus equipped with longitudinal wires would be exactly the fabric shown in figures 14, 11 and 15 of the Kitselman patent, would it not?

A. Yes, subject, however, to the possibility of some difficulty in producing it easily and nicely, owing to the fact that the warp wires would lack side support in the twisting zone. But it could produce the fabric.

338 X Q. 53. The Davisson machine, just as it is shown and described in his patent sued on, has the capacity of weaving the Kitselman, the Conner and the Pope multi-stranded woven-wire fabric, does it?

A. Certainly, in the factory.

X Q. 54. Whether or not the Davisson machine produces the Kitselman, Conner and Pope multi-stranded fabric is a matter of manipulation, or mode of operation, of such machine, is it not?

A. Hardly. It is a matter of motive, the supply of material, and the manner of threading that material into the machine preparatory to its beginning work. After that, the operation of the machine, and the manipulating of it, is the same regardless of whether it is making simple netting or Kitselman fencing.

X Q. 55. I mean that if the operator desires to do so he can weave the Kitselman, Conner and Pope multi-strand fabric on the Davisson machine—is not this correct?

A. Certainly, understanding that the fabric becomes a factory product merely, and that nicety of product may not be so well realized as in the Kitselman machine and its followers.

X Q. 56. In the Conner machine the switching takes place automatically at stated periods, notwithstanding the crank is rotated constantly in the same direction—is not this correct?

A. In the exemplifying machine set forth in the Conner patent the switching takes place without a change of direction of motion of the twisters, the time of change being in accordance with the number of twists desired at the intersections, and being a variable quantity.

X Q. 57. In the defendants' machine the switching can never take place without there being a change of the direction of rotation—is not this correct?

A. In defendants' machine, the rotation of the twisters having

been continued long enough to insure that the reels have gone into completed and positive association with certain twisters, no transference or switching of reels can take place without reversing the direction of rotation of the twisters. That is the case as I understand the possibilities of defendants' machine.

X Q. 58. Did not the defendants' machine, in your opinion,
339 involve invention over the Davisson, Kitselman, Conner and Pope machines, shown and described in their patents?

A. I am inclined to think that an inventor has been at work at it, but I am not prepared to admire the result. I think any admiration is bound to receive a rude shock when these side sections exercise their vicious tendency, under very slight provocation, to tumble out of the machine. If an inventor has worked at this machine, I do not think he can be said to have produced any new improved result. All the good results appear to be the results inherent in the patents in suit on which it was founded, and the differences in result, such as side sections going on a strike without warning, of bad results.

X Q. 59. If the spindles of the Pope patent were revolving with the gears, instead of being stationary, what invention would it contain over the Davisson patent, or the Kitselman or Conner patents?

A. Such invention as is recognizable in the advantages of reel-carriers directly engaging the driving gears instead of intermediately; in the less number of parts involved; in a thoroughly accessible system of reels and reel-carriers in conjunction with the transfer system founded exclusively upon transverse motion.

X Q. 60. Those points of invention that you have enumerated are not made the subject of claims in the Pope patent, are they?

A. I have not at any time examined the claims of the Pope patent, except those in suit, and those claims involve the stationary spindles.

Redirect examination by Mr. PARKINSON:

R. D. Q. 61. Referring to your answer to X Q. 16, is it or is it not your intention by that answer to express an opinion concerning the practical operativeness of the Nesmith machine?

A. That answer simply intended to state that the fabric apparently designed to be made on the Nesmith machine, and in question
16 called the Nesmith fabric, could also be made on the Da-
340 visson, Kitselman and Conner machines. But I certainly did not intend to express the opinion that the Nesmith machine was an operative machine capable of weaving any kind of a fabric, for I am not at all satisfied that it could be operated, indeed, without some unshown and unexplained provision to keep the outer woof wires from pulling out of the border-twisters, where those wires converge to those twisters, I am satisfied the machine would not operate successfully. And this is entirely apart from any defects which might exist in the very dubious feeding machine.

The certified copy of original drawings Nesmith patents are offered in evidence by complainants, and marked "Complainants' Exhibit Nesmith Drawings."

Recross-examination by Mr. BANNING:

R. X Q. 62. Do you not know that for many years John Nesmith was a large manufacturer of woven-wire fabric in New England, using the machine of his 1854 patent?

A. I do not.

(Signed) JAMES W. SEE.

Adjourned until tomorrow morning at 10 o'clock.

JANUARY 25, 1899—2 o'clock p. m.

Met pursuant to agreement; present: Dwight B. Cheever, Esq., representing Mr. Parkinson, on behalf of the complainants; Thomas A. Banning, Esq., on behalf of the defendants.

JOHN C. POPE, a witness produced on behalf of the complainants, being first duly sworn, deposes and says, in answer to interrogatories propounded to him by Mr. Cheever, representing Mr. Parkinson, as follows:

Q. 1. Please state your name, age, residence and occupation.

A. John C. Pope; 59 years old; residence, Kendall county, Kendall town, Illinois; occupation, farmer up to two years ago and am now working in the fence business.

Q. 2. Are you the inventor of United States patent No.
341 505,607, issued September 26, 1893, which is in suit in this case?

A. Yes.

Q. 3. Will you please state when you first conceived the subject-matter of the invention shown, described and claimed in that patent, and particularly the part covered by claims 1, 9 and 10?

A. The 16th of February, 1892.

Q. 4. Is there any event which happened at that time which caused you to fix in your memory that date, and if so, please state what that event was.

A. I went to a sale at Newark, Illinois, and saw a piece of this fence, and came home and started to make a machine to build it. Of course, that brought out this invention.

Q. 5. How soon after you returned from the sale at Newark did you begin working on such a machine, and what did you do first?

A. I went to work to make a wooden model—I could not say as to how long—a very few days.

Q. 6. Please describe, as near as you can, this wooden model, and say about when you completed it?

A. Well, I should say the wooden model embodied the same principles of this same machine. I may have been at work on it six weeks or two months.

Q. 7. Is, or is not, that wooden model still in existence?

A. I think parts of it; yes.

Q. 8. Is the model, as a whole, in existence?

A. No.

Q. 9. After this model, what did you next do towards perfecting your invention?

A. I made some rough patterns and castings at Hoyt Brothers, Aurora, Illinois.

Q. 10. What did you do with those castings?

A. I made a machine with those. I did not make this working machine that you have a photograph of, but I changed them a little and got some more castings and made a working machine.

Q. 11. When was this working machine completed?

A. I should say about the middle of September, 1892.

Q. 12. Did you have any photographs taken of this working machine?

342 A. Yes.

Q. 13. Do you remember who took them?

A. A man by the name of Sabin.

Q. 14. I now hand you a photograph of a fence machine bearing at the lower edge the name "Sabin," and ask you to state whether or not that is one of the original photographs of your complete fence machine which you have just testified about?

A. It is.

The photograph produced by the witness is offered in evidence, marked "Complainants' Exhibit Photograph of Pope's First Machine."

Q. 15. Will you please state again when that photograph was taken?

A. About the middle of September, 1892.

Q. 16. How many copies did you have of that photograph?

A. Two.

Q. 17. What did you do with the other copy?

A. I sent it to Snow—C. A. Snow, Washington.

Q. 18. For what purpose?

A. For the purpose of seeing if he could make a drawing from it, also to see if it was patentable.

Q. 19. Had you had any correspondence with Mr. Snow prior to the time you sent that photograph to him?

A. Yes, sir.

Q. 20. Was that correspondence with regard to a patent on the invention shown in this photograph?

A. Yes.

Q. 21. At the time you first conceived the invention did you tell any one about it? If so, who?

A. I told my son about it; also my family, of course.

Q. 22. Did any one work with you on the construction of the wooden model? If so, whom?

A. My son and myself.

Q. 23. Did, or did not, your son work with you in the construction of the complete machine shown in the photograph?

A. Yes.

343 Cross-examination by Mr. BANNING:

X Q. 24. You appear to have assigned or sold your right in this patent No. 505,607 to A. L. and D. M. Kitselman before the patent was issued. Did you reserve any rights at the time you made that sale?

A. I did.

X Q. 25. What were they?

A. I reserved the use of the stationary tube, or spindle.

X Q. 26. I see that in the 1st, 9th and 10th claims one of the elements called for is a stationary elongated warped wire tube. Is that what you refer to?

A. Yes, sir.

X Q. 27. How did you reserve the right to use that?

A. I reserved it to my use.

X Q. 28. Do you mean that you reserved the right to make, sell and use machines like those described and called for in these claims of your patent referred to?

A. So far as that tube would be concerned, yes.

X Q. 29. Was that right limited to any particular State, county or place?

A. No, sir.

X Q. 30. Was it anywhere you pleased throughout the United States?

A. Yes, sir.

X Q. 31. I do not know that I quite understand what you mean in saying that you had the right so far as the stationary tube is concerned when you had the right to use the stationary tube or spindle. Did you or did you not have the right to use it in connection with the other parts mentioned in these claims 1, 9 and 10?

A. I think I did.

X Q. 32. Do I understand you, Mr. Pope, that you reserved, or that there was reserved to you, a license to make, sell and use the machines called for in the 1st, 9th and 10th claims of this patent when you sold it to Kitselman Brothers? Is this correct?

A. In part, I should say. I consider that there was a reserve made of those claims set forth in the patent.

344 X Q. 33. Have you ever made, or sold, any machines since your sale to Kitselman Brothers?

A. I have another patent embodying those claims under which I am now selling.

X Q. 34. That is a subsequent patent—an improvement on this patent—is it not?

A. Yes, sir.

X Q. 35. Where are you manufacturing and selling machines—at what place?

A. Sandwich, Illinois. I am living at Plano.

X Q. 36. How long have you been making and selling fence machines there?

A. Two years.

Redirect examination by Mr. CHEEVER:

R. D. Q. 37. In this photograph which was identified by you in direct examination and offered in evidence there appear horizontal wires extending across the photograph through the spindles of the machine. At the right of the machine there appear cross-wires connecting these horizontal wires, and no such cross-wires appear at the left of the machine. Will you please state whether or not the fence consisting of the horizontal wires and the cross-wires at the right of the machine were made by the machine before the photograph was taken?

A. Yes, sir.

R. D. Q. 38. In cross-examination you were asked as to your having reserved some rights at the time you assigned your patent to Kitselman Brothers. Was that reservation made in writing?

A. Yes, sir.

R. D. Q. 39. Does that written reservation show all of your rights reserved at the time you made the sale?

A. I think it does.

R. D. Q. 40. Have you that instrument with you?

A. I have.

R. D. Q. 41. Will you please produce it for examination?

A. I do.

R. D. Q. 42. This instrument which you have produced
345 bears date of July 22, 1893, and is signed by Kitselman Brothers by A. L. Kitselman. Do you know, of your knowledge, that that signature is genuine?

A. Yes, sir.

R. D. Q. 43. Was there another copy of this same instrument signed by you?

A. Yes, sir.

R. D. Q. 44. Is this the only agreement in writing by which any rights were granted or reserved to you under your patent here in suit?

A. Yes, sir.

The paper identified by the witness is as follows:

Memoranda of agreement made and entered into this 22nd day of July, 1893, by and between John C. Pope, of Fox station, county of Kendall and State of Illinois, of the first part, and Alva L. Kitselman and Davis M. Kitselman, comprising the firm of Kitselman Brothers, of Ridgeville, county of Randolph and State of Indiana, of the second part.

This agreement witnesseth that the said John C. Pope, party of the first part, agrees with the parties of the second part to assign to them all his right, title and interest he now has and holds in an application for a patent now pending in the Patent Office of the United States for wire-fence machine, and agrees to make, if so called upon by second parties, application for patents in the Dominion of Canada in the same manner, to be held and enjoyed by the parties of the second part the same as it would have been held and enjoyed

by me had said assignment not been made, during the life of such patent or patents, if issued or allowed by the Commissioner of Patents as now pending or modified in such application, as follows:

The parties of the second part agree to pay the said John C. Pope a reasonable compensation for such assignments of application, and if such patent or patents are allowed for the said wire-fabric machine, now pending and applied for by the said John C. Pope, the said parties of the second part agree with the said John C.
346 Pope to pay him the sum of one hundred and fifty dollars in full, to cover all his labor and expenses while inventing the same, provided the said invention proved useful and of benefit to the parties of the said second parties in a suit and interference case with one W. D. Whitney. In case no patent is allowed and such application proves of no importance in said interference case or suit, then the said John C. Pope shall receive no further compensation of the parties of the second part.

It is further agreed that in case a patent is allowed on the said invention now pending and the parties of the second part should utilize or manufacture or in any way make use of such patents beneficial to themselves, then the second parties agree to pay to the first party a suitable compensation to reimburse the party of the first part.

In case the patent on said invention is allowed in Canada and the parties of the *first* part should realize on said patent, then the said John C. Pope shall receive an extra compensation after all expenses are deducted and incurred by parties of the second part in suit and interference case.

In case a patent on stationary spindle in said machine is allowed, the said John C. Pope shall have the right to use such patent on stationary spindle, in any new invention of the same character, but such invention, as invented by the said John C. Pope, in wire-fabric machines, the parties of the second part shall have the first refusal to purchase or manufacture such invention.

In witness whereof we hereunto subscribe our names this day and date first above written.

KITSELMAN BROS.,
By A. L. KITSELMAN.

R. D. Q. 45. Please examine the photograph marked "Complainants' Exhibit Photograph of Pope's First Machine," and state whether or not the spindles there shown through which the horizontal wires pass were stationary.
347 A. Yes; they were.

R. D. Q. 46. When did you first conceive the idea of making such stationary spindles?

A. In February, 1892.

R. D. Q. 47. When did you first describe the use of such stationary spindles to any one?

A. In February, 1892.

R. D. Q. 48. To whom?

A. My son.

R. D. Q. 49. Please state whether or not the machine shown in the photograph above referred to contained all the features set forth and claimed in your patent here in suit?

A. It did.

R. D. Q. 50. Please state whether or not this machine was a complete operative machine at the time the photograph was taken?

A. It was.

Recross-examination by Mr. BANNING:

R. X Q. 51. How do you remember or fix the date of February 16, 1892?

A. It was the date of a sale I went to on that day and saw the fence.

R. X Q. 52. What enables you to fix the date of that sale on February 16?

A. On my way to this sale there was a piece of fence of this make. I made up my mind it was a good thing and went to work at this machine from seeing this on that day.

R. X Q. 53. Have you any writing of any kind to fix the date when you say you saw that fence on February 16, 1892?

A. I have not.

R. X Q. 54. Is it not a fact, Mr. Pope, that you have to depend upon your memory or recollection as to the date when you saw that fence as the date when that sale took place?

A. No.

R. X Q. 55. What have you got beside your memory?

A. I went and inquired of this man's son as to the date of that sale and he said it was February 16th.

348 R. X Q. 56. Aside from the statement of the man's son to you you have to depend upon your recollection or memory, do you not?

A. Yes, sir.

R. X Q. 57. Do you know that the man's son gave you the correct date?

A. I do not.

R. X Q. 58. At the time of the sale did you see any machine for making wire fence, or simply the piece of fence?

A. I simply saw the fence.

Redirect examination by Mr. CHEEVER:

R. D. Q. 59. Is there anything connected with your going to that sale which would enable you to say approximately when it was?

A. I don't think there was. I only recollect that that was the first time I saw the fence.

R. D. Q. 60. Do you remember whether or not there was snow on the ground?

A. I should say the weather was a good deal like it is now. I don't think there was any snow on the ground, but it was quite soft weather.

R. D. Q. 61. Do you remember whether it was cold weather?
A. It was not very cold.
(Signed) J. C. POPE.

JOHN C. POPE recalled.

By Mr. CHEEVER:

Q. 1. You have testified that you fixed the date of the conception of invention by a sale at Newark, Illinois. Please state what sort of a sale it was and whose?
A. It was a sale of farm property on the farm of E. Neff.
Q. 2. Whereabouts was it?
A. At Newark, Illinois.
Q. 3. What goods were sold at that sale?
A. Personal property, such as hogs, sheep, farm implements, belonging to E. Neff.
(Signed) J. C. POPE.

349 WILLIAM J. POPE, a witness produced on behalf of the complainants, being first duly sworn, deposes and says, in answer to interrogatories propounded to him by Mr. Cheever, representing Mr. Parkinson, as follows:

Q. 1. Please state your name, age, residence and occupation.
A. William J. Pope; age, 24 years old; residence, Plano, Illinois; in the fence business and run a shoe store in Plano.
Q. 2. What is the name of your father?
A. John C. Pope.
Q. 3. Is he the man of the same name who is the inventor of patent No. 505,607 issued September 26, 1893, which is here in suit?
A. Yes, sir.
Q. 4. Please state, if you can, when he first described to you the invention shown in that patent and particularly the invention set forth in claims 1, 9 and 10, as fully appears in the exhibit marked "Complainants' Exhibit Pope Patent," which I now hand you.
A. Between the first and not later than the sixteenth of February, 1892.
Q. 5. What, if anything, did you and he do towards constructing a machine embodying that invention, and how soon did you do it after he first described the invention to you?
A. We cut out some wheels from a board and put them together about a week after he thought of the invention.
Q. 6. What event took place at the time your father made the invention which enabled you to fix the date?
A. The sale at Newark.
Q. 7. Whose sale was it?
A. E. Neff's.
Q. 8. What sort of goods were sold at that sale?
A. Farm machinery and horses, hogs, cattle.
Q. 9. Was it an auction sale?
A. Yes.

Q. 10. Did the wooden model which you have referred to contain a stationary spindle for the horizontal wires?

A. Yes, sir.

Q. 11. Do you know whether or not that wooden model is still in existence? If so, please state.

350 A. I am not sure of it.

Q. 12. About how long after your father first conceived the invention was the wooden model completed?

A. About a week and a half.

Q. 13. After you got through with the wooden model what was next done towards building a complete machine showing the invention?

A. We made the patterns and got some castings from them.

Q. 14. What did you do with the castings?

A. Put them into a machine.

Q. 15. When was the machine completed?

A. Some time in April—along about that time—1892.

Q. 16. Was that machine a complete operative working machine?

A. Yes, sir.

Q. 17. Did you have a photograph taken of that machine?

A. Yes, sir.

Q. 18. Can you state about when that photograph was taken?

A. In September, some time.

Q. 19. I now show you a photograph marked "Complainants' Exhibit Photograph of Pope's First Machine," and ask you to state whether or not it is a photograph taken at the time just mentioned?

A. Yes, sir.

Q. 20. Please examine this photograph and state whether or not the horizontal spindles shown therein were stationary upon the machine.

A. Yes, sir; they were.

Q. 21. Was that machine at the time that photograph was taken a complete and fully operative machine?

A. Yes, sir.

Q. 22. Did it contain all the features set forth, described and claimed in the patent in suit, a copy of which you have examined at the beginning of your deposition?

A. Yes, sir.

Q. 23. Was the fence which appears in the photograph at the right of the machine made by the machine working in the field before the picture was taken?

351 A. Yes, sir.

Cross-examination by Mr. BANNING:

X Q. 24. Did you attend the sale at E. Neff's?

A. No, sir.

X Q. 25. How do you come to remember the date of that sale?

A. From father being there and from my brother-in-law being there.

X Q. 26. Do you have any memoranda, or writing, to fix that date as February 16, 1892?

A. No, sir.

X Q. 27. You depend upon your recollection or memory, do you not, for the date?

A. Yes, sir.

X Q. 28. What was done with the wooden parts that you made, wheels, etc.?

A. It was let go to pieces. Not very much pains taken with the wooden model.

X Q. 29. Was that wooden model used to weave woven-wire fence fabric with?

A. Yes, sir.

X Q. 30. I am speaking of the wooden model.

A. We used it with cord, with common thread spools on it.

X Q. 31. You used cord and thread to weave with in place of the wire?

A. Yes.

X Q. 32. You never wove any wire fabric with that wooden model?

A. Not with that wooden model.

X Q. 33. How large was the model?

A. Three wheels to make a three-strand fence.

X Q. 34. Did that wooden model have a crank?

A. No, sir.

X Q. 35. How did you turn the wheels?

A. Turned them with our hands.

X Q. 36. Each one separately?

A. Yes, we did at that time.

X Q. 37. When do you say this photograph was taken?

A. About the middle of September, 1892.

352 X Q. 38. How do you fix that date?

A. I fix it by my father going to Yorkville to get the gentleman to take the picture.

X Q. 39. You remember the circumstance of your father's going, but how does that fix the date?

A. I could not say exactly as to the day.

X Q. 40. Is it not a matter of memory or recollection?

A. Yes, sir.

X Q. 41. You have no writing or memorandum to fix the date?

A. No, sir.

X Q. 42. Have not you and your father talked this matter over about the dates in the last day or two, or even today?

A. Yes, sir.

(Signed) WM. J. POPE.

FEBRUARY 2, 1899—11.30 o'clock a. m.

Met pursuant to agreement; present: D. B. Cheever, Esq., representing Mr. Parkinson, on behalf of the complainants; T. A. Banning, Esq., on behalf of the defendants.

C. M. SABIN, a witness produced on behalf of the complainants, being first duly sworn, deposes and says, in answer to interrogatories propounded to him by Mr. Cheever, on behalf of the complainants, as follows:

Q. 1. Please state your name, age, residence and occupation?

A. C. M. Sabin; age, 36; residence, 4711 St. Lawrence avenue, Chicago; occupation, Pullman conductor.

Q. 2. Were you at any time a photographer at Yorkville, Illinois, and, if so, will you please state when you ceased that business?

A. I was photographer at Yorkville, Illinois, from 1886 until about the 1st of April, 1893.

Q. 3. Have you been engaged in the photograph business at any time since you ceased business at Yorkville?

A. I have not.

Q. 4. Did you while at Yorkville take any photographs for
353 Mr. John C. Pope of a machine for making wire fence; if so, will you please state, as near as you can, when that picture was taken?

A. I did make a picture of a machine for Mr. Pope, I think in 1892, although I am not certain as to what date, but it was some time before I quit the business there. I remember at the time of taking the picture the weather was warm and it was not like the weather that would have been at any time during the time I was in business in 1893 at Yorkville.

Q. 5. I now hand you a photograph, having endorsed on the back the title of this case, and marked "Complainants' Exhibit Photograph of Pope's First Machine," and ask you to state whether or not it is the photograph you have just testified to have taken?

A. This is the photograph. It is the only photograph of such machine that I ever made for Mr. Pope.

Q. 6. Please examine the photograph again and state whether you see anything shown on this photograph which would confirm your opinion as to the season in which the picture was taken?

A. I think it was made in 1892, as at no time during the year 1893 while I was in business would the grass have shown as it does here.

Q. 7. Do you remember the residence of Mr. Pope, for whom you took the photograph?

A. I do; it is about two miles southwest of Yorkville, at Mr. Pope's farm.

Cross-examination waived.

(Signed) C. M. SABIN.

FEBRUARY 1, 1899—10 o'clock a. m.

Met pursuant to adjournment; present: same as before.

MELVILLE E. DAYTON recalled.

By Mr. PARKINSON:

Q. 1. State your name and whether or not you are the person of the same name who has before testified in this case.

A. My name is Melville E. Dayton, and I am the same person of that name who previously testified in this case.

354 Q. 2. Have you read the deposition of Mr. Wiles, taken in behalf of defendants herein, and examined the patents and other exhibits mentioned by him in that deposition?

A. I have.

Q. 3. Referring, now, to the Davisson patent here in suit, and particularly to the invention recited in the second and third claims thereof, have you examined the prior patents and other exhibits here in evidence with reference to the question whether they exhibit mechanisms corresponding substantially to that mentioned in these claims, and also with reference to the question whether anything exhibited in the prior art would tend to limit or modify these claims within the scope attributed to them in your former testimony?

A. I have.

Q. 4. Please state whether or not you find in any of the prior exhibits disclosed, suggested or described the subject-matter of the second or third claims of the Davisson patent, or either of them, or anything substantially equivalent thereto; and also whether or not you find in any of them anything which, in your opinion, would materially limit or qualify those claims or modify the opinions which you have heretofore expressed concerning the substantial correspondence of defendants' machine with the subject-matter of these claims, giving your reasons for such opinion as you may express.

A. I do not find disclosed, suggested or described in any exhibit of the prior art, the subject-matter of the second or of the third claim of the Davisson patent nor anything substantially equivalent thereto; and I also do not find in any of said exhibits anything which, in my opinion, tends to limit or qualify those claims, nor which modifies the opinion I have heretofore expressed concerning the substantial correspondence of defendants' machine with the subject-matter of those claims. On the other hand, the comparison of the Davisson patent with the prior art brings out into bolder relief the distinctive novelty of the Davisson invention and makes more clear the substantial identity of defendants' machine with that of the Davisson patent with respect to the subject-matter of the second and third claims referred to.

Giving my reasons for these conclusions, I first point to the 355 fact that the prior art in machines for weaving wire netting discloses, broadly, but a single kind of twisting device, namely, a rotating disk provided with passages through it for the

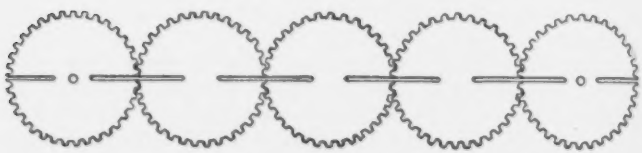
wires to be twisted. There were two forms of this rotating disk twister, one in which the disk is integral and has opposite radial slots extending inward from the margin of the disk towards its center, and the other in which the disk is diametrically divided and each half is provided with a hole for the wire at some distance from the center. These disks were provided with peripheral cogs or gear teeth, and, in the case of the slotted gears, said gears were intermeshed with each other, while in the case of the divided gears said gears were not intermeshed with each other, but were engaged with longitudinally reciprocatory racks. The divided gears were also combined with devices by which the half gears could be shifted in the direction of their diametrical divisions (brought into line with each other) so as to pair each half gear alternately with either of the two adjacent half gears on the opposite side of the division line.

DAYTON'S SKETCH OF PRIOR TWISTERS.

No. 1.—Slotted-gear wheels.—wheels intermeshed.

(e. g. Nesmith-Sedgwick.)

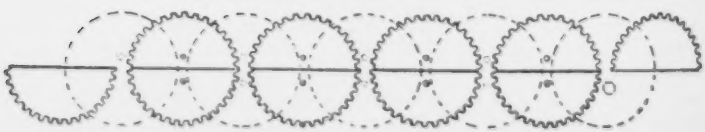
End Gears With or Without Central Holes.



No. 2.

Half Gear Wheels—Halves Shiftable, from One Fellow-half to Next One and Back.

(e. g. Whitehead-Combs.)



356 I here introduce, to be made a part of my deposition, a sketch illustrating these two forms of the disk twister known in the art prior to the Davisson patent. The sketch is entitled "Dayton's sketch of prior twisters." Form No. 1 shows the gear wheels radially slotted as above described, as for example shown in the Nesmith patent and the Sedgwick patents, and form No. 2 shows the divided twisting gears shown in the Whitehead British provisional specification which is prior in date to the Davisson patent in suit, and also in the Combs United States patent which shortly followed in date the Davisson patent in suit.

In the use of these disk twisters of the older art all the wires entering into the fabric proceeded *from behind the disks* or gears from suitable spools, reels or cops. It is, therefore, obvious that in the absence of means for preventing the result, the rotation of the twister gears to twist the wires in front of them would also twist the said wires behind them. This objectionable action was prevented by one or another form of device for carrying at least one of the supply spools around the other one engaged in feeding to the same twist, and this feeding mechanism became known distinctively as the feeder part or "feeder" of the machine. The "feeder" of such netting machines was therefore contrived to perform the function of an anti-twister or anti-tangler in such machines. Any one who has seen a lady braid her hair and observed how she draws her fingers through the long unbraided portion of her hair as the braiding proceeds, or who has ever in his youth braided a whip lash and been compelled to continually run his fingers through the strands from the braid to their free ends in order to prevent their becoming entangled with each other, will clearly appreciate the necessity of an anti-twister or anti-tangler in one of these old wire netting machines employing the slotted or divided gear twisters above referred to and shown.

Such was the character of prior netting machines at the date of the Davisson invention. The exhibits Nesmith and Sedgwick patents employed the slotted-gear wheels above designated as form No. 1 and the Whitehead exhibit illustrates the divided gears above designated as form No. 2.

Concerning these machines of the prior art it should be
357 further mentioned that sometimes provision was made for the introduction into the fabric of special, heavier, marginal wires to form the straight edges of the fabric and sometimes no special wires were introduced for this purpose, the straight edges being formed of one of the wires entering into the marginal twists. Special marginal wires being usually heavier than the mesh wires, to facilitate their introduction and avoid their deflection in the operation of the machine, central holes for their passage were made in the end disks or gears of the slotted twisters shown above as form No. 1. So far as the prior art shows, or so far as I am aware, special marginal wires passing through the center of rotation of the twisters were confined to those machines employing the radially slotted twisters, as, for example, in the Nesmith and Sedgwick patents. A vague and unintelligible proposal to introduce such special marginal wires is made in the brief and unillustrated provisional specification of the Smith British Patent Exhibit, but there is nothing in the prior art which shows or tells how this could be done in connection with the divided gears (say, of the Whitehead provisional specification), and the fact remains that machines in the art prior to Davisson in suit, adapted for the introduction of marginal wires through the axes of the marginal twister gears, were confined to that form of machine employing the integral radially slotted gear twisters of the above illustrated form No. 1.

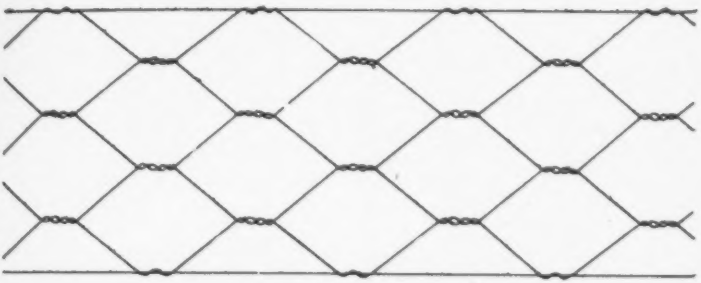
The Sedgwick patents (differing from each other in details of the

feeder mechanism and other minor matters, but corresponding with respect to their use of the slotted-gear twisters) propose the introduction of straight tension wires into the fabric between its margins and in addition to the special straight marginal wires. But, by reason of Sedgwick's adherence to the older slotted-gear twister and to the accompanying arrangement of all the supply spools in a feeder mechanism back of the gear twisters, he was unable to simultaneously twist two mesh wires upon any such intermediate tension wire, and the result was that his machine could produce only what my colleague, Mr. See, has happily termed a "twin netting," or, in other words, two essentially separate nettings united to a common marginal
358 wire. In other words, the two mesh wires on opposite sides of any such intermediate tension wire made on a Sedgwick machine did not converge and unite with the intermediate tension wire at the same points, but at different points, alternating with each other throughout the length of the fabric.

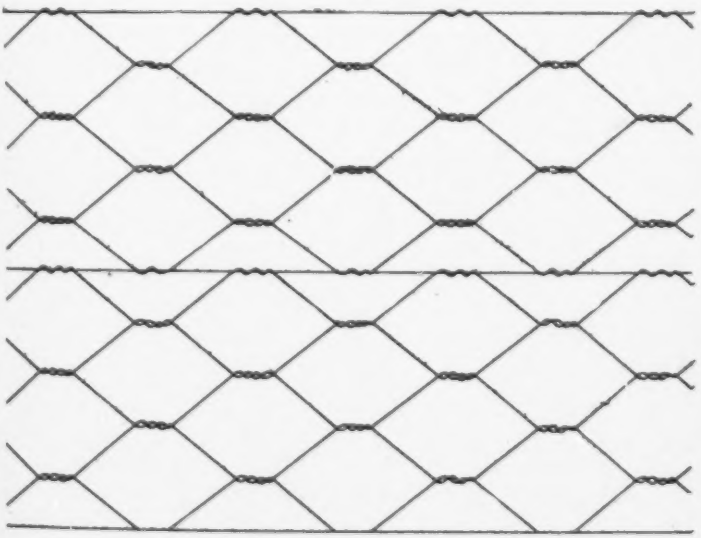
(Here follow diagrams marked pp. 358, 359, & 360.)

Dayton's Sketch of Prior Fabrics.

No. 1. (Wesmith)



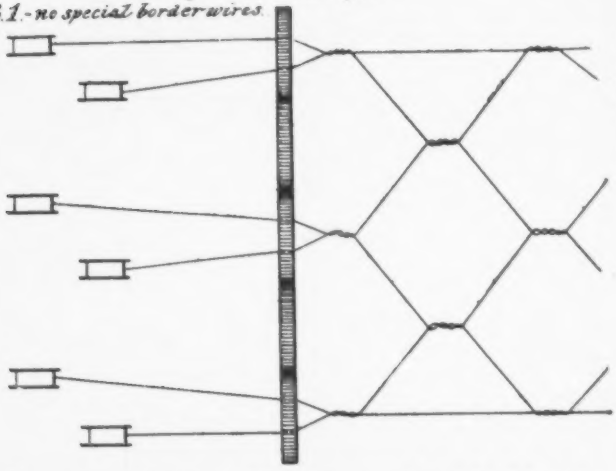
No. 2. (Sedgwick.)



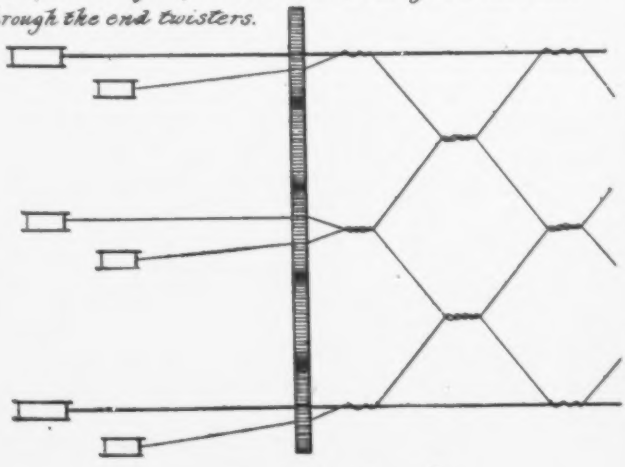
No. 148.
Kokomo Co.
Gilman
} p. 058

Daytons Sketch of Prior Machines.
(Slotted-gear twister Type)

No. 1 - no special border wires.

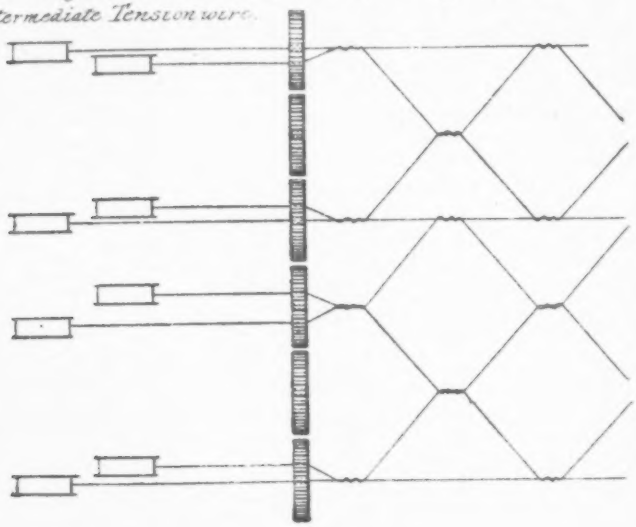


No. 2 - provision for special border wires by central holes through the end twisters.

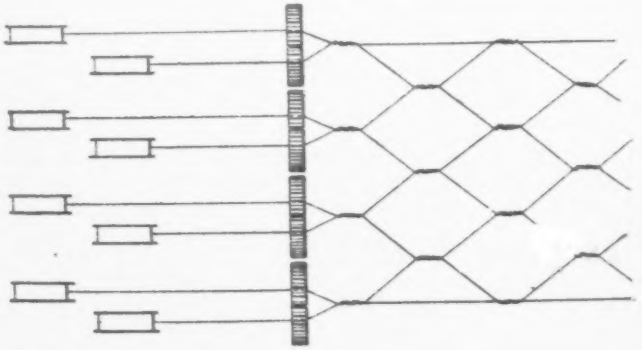


No. 148.
Kokomo Co.
v.
Kitselman.
} p. 359.

No. 3 - Sedgwick Slotted-Gear Machine, working with an intermediate Tension wire.



Prior Machines of Divided-Gear Type



No. 148.
Kokomo Co.
v.
Kitselman } p. 360

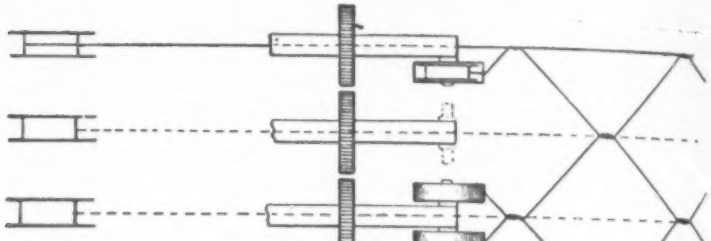
361 I here introduce as part of my deposition a sketch giving two illustrations showing the fabrics possible to be made prior to the Davisson patent. The sketch is entitled "Dayton's sketch of prior fabrics." Illustration No. 1 represents the fabric made by the Nesmith machine and, of course, capable of being made by the Sedgwick machine, while illustration No. 2 shows the "twin netting" also possible by the Sedgwick machines.

To conclude this general description of prior machines for making wire netting, I here introduce as part of my deposition further illustrations, in general plan view and in the nature of diagrams, showing machines of the art prior to the Davisson patent here in suit. The sketch is entitled "Dayton's sketch of prior machines." Figure 1 shows machines employing slotted-gear twisters without special provision for heavy marginal wires; figure No. 2 illustrates the same type of machine with heavy marginal wires passing through the centers of the end twisters; figure No. 3 shows the special Sedgwick machine with an intermediate tension wire and threaded in the only way in which it can be operated when such intermediate tension wire is introduced, and figure 4 illustrates the essentials of the old machines employing the divided form of twister gears.

It will be observed that in all these illustrations of machines, faithfully taken, as to their essentials, from the prior patents in evidence, the same disk twisters are employed, and the same necessary accompanying arrangement of *all the supply spools back of the twister disks* is preserved.

In contrast with the prior art as above shown, I next introduce into my deposition a diagrammatic illustration of the Davisson invention, entitled "Dayton's sketch of Davisson's invention." There is here shown, also, a row of gears, *but these gears are not twisters.* They are neither slotted nor divided and perforated, to give passage to the mesh wires. Indeed, *the mesh wires do not pass through these gears.* On the other hand, the spools which supply the mesh or woof wires, instead of being placed behind the gears whence their wires would need to pass through said gears, are placed in front of the gears and adjacent to the points where the wires pass from
362 them into the twists of the fabric. In this new position, the mesh-wire spools of the Davisson machine have also a *new function.* In the old art, they merely supplied wire which was twisted by the twister gears. In this new position given them by Davisson they not only supply the mesh wire, but they become vital agents in the twisting operation. *They are the twisters.* The gears of the

Dayton's Sketch of Davisson Invention.



1st. The gears are neither slotted nor divided.

2nd. The gears are not "twisters" but mere spool-revolvers.

3rd. The mesh-wire spools are here (for the first time) made twisters.

(a.) In making the mesh-wire spools twisters, they are (for the first time) put in front of gears, and adjacent to the points where the twists are made.

(b.) This leaves only tension-wire spools back of the gears and abolishes all former complications growing out of the presence of the mesh-wire spools back of the gear twisters.

Davisson machine are merely to revolve these spools in order that, in their new position, said spools may do the twisting. Hence, as the mesh-wire *spools* in the Davisson machine have taken
363 on a new function, so the *gears* of the Davisson machine have surrendered an old function, the former twisting function of the gears being now, in Davisson, transferred to the mesh-wire spools in their new position and relation.

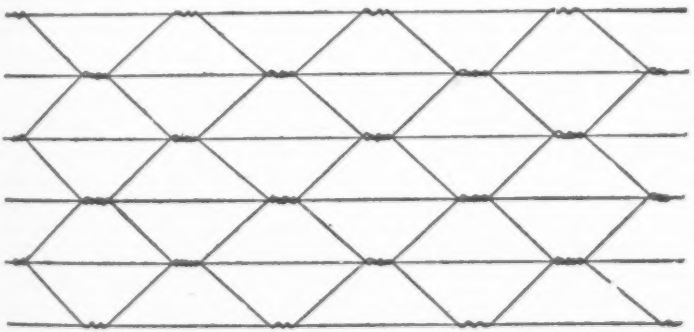
So much for changes made by Davisson in old parts. It will next be observed that Davisson has introduced wholly new parts, to wit, the spindles A A. These spindles have no existence anywhere in the prior art in question. Said spindles in Davisson's invention are in the axes of the gears, and are made hollow to permit the passage through them of tension wires leading from tension-wire spools still retained back of the gears. These wholly new spindles form definite supports for the tension wires passing through them and, in the precise construction illustrated by Davisson, form the medium through which the gears revolve the twisting spools which supply the mesh wires. In other words, in the precise construction shown by Davisson the hollow spindles are rotatively rigid with the gears and the mesh-wire spools are conveniently attached to the spindles

instead of to the gears themselves by which, however, said spools are revolved, as stated.

All the spindles A A being hollow, or as many of them, additional to the marginal ones, as may be desired, being made hollow, not only may a fabric having two special marginal tension wires be made of any desired width, but, quite unlike the Sedgwick machine, longitudinal tension wires may be inserted through all or any number of the meshes of the fabric and through the twists where the mesh wires are twisted together. The Davisson machine is therefore capable of producing a form of wire-netting fabric such as was produceable by no machine of the prior art and such as is nowhere shown to have an existence prior to Davisson's invention. And this particular fabric turns out to be the principal product produced in the manufacture of wire fencing at the present time, being stronger, more rigid and more durable, I believe, than any other form of netting or fencing in which the same weight of wire can or has been disposed. I refer to the form of fabric next below illustrated and also shown in Figs. 10 and 11 of the Kitselman patent in
364 suit, but not shown in the drawings of the Davisson patent.

Dayton's Sketch of New Fabric. Capable of Being Made by the Davisson Machine.

Taken from Figs. 10 *and* 11 *of Kitselman's Patent.*



This cut which I here introduce is marked "Dayton's sketch of new fabric, capable of being made by the Davisson machine." Indeed, it is not clear that Davisson at the time of taking his patent had thought of this form of fencing or had discovered that his machine would make it. This is the fence to which Mr. Wiles, defendants' expert, evidently has reference in his answer to Q. 4, where he mistakenly says that the machine of the Nesmith patent and the machines of the two Sedgwick patents could make it, and that the said Sedgwick patents "describe the fabric made by the machine of the respective patents, as having edge wires and intermediate tension wires, if the latter be needed." What the Sedgwick patents could

make in the nature of fabric having an intermediate tension wire is shown in illustration No. 2 of my preceding sketch of "prior fabrics."

The capability of the Davisson machine to produce this particular fabric results from the provision, first made in the art by him, for revolving two mesh-wire spools simultaneously around the same intermediate tension wire, in connection with the provision of holes through his intermediate spindles for the passage of such tension wire.

From the foregoing comparison of the Davisson machine
365 or invention with the prior art it seems to me clear that Davisson made a most radical departure from the prior art and that his invention, in view of its radical differences from the prior art and of its results in making a new form of fabric possible and of begetting a new line of inventions (as shown by the improvements thereon set forth in the other patents here in suit, not to mention defendants' machine), is to be fairly regarded as of revolutionary character. This Davisson invention, instead of being restricted to the terms of the claims, is on the other hand, in my judgment, much broader than these terms, and if the terms of the claims in suit were not ample to embrace the structure found in defendants' machine, said claims would, in my opinion, by reason of the pioneer character of the invention, be entitled to such interpretation as would unquestionably include said defendants' machine.

The claims in suit are, in part, in terms of spindles. In claim 3 the spindles are defined as "hollow" spindles. These claims evidently might have been more broadly expressed. But defendants' machine has the spindles, and it is no departure from the claim in this particular. Both claims locate the mesh-wire spools at the sides of the spindles by the terms, "having on each spindle a cross-head carrying reels for wire on opposite sides of the axis of said spindle." Not only were the spindles new in the art with Davisson, but mesh-wire spools or "reels for wire on opposite sides of the axis of said spindle," and therefore in front of the gears, for revolving the reels, were new with Davisson. And defendants' machine has this feature also. Both claims specify a "cross-head" on the spindle for carrying the "reels for wire." The patent in fact shows on each spindle two cross-heads, either one of which is, to a mechanic, obviously available for "carrying" these spools or reels around the spindle axis. One cross-head shown in the patent is the gear wheel and the other is the cross-bar or pair of arms at the free front end of the spindle. It is to the cross-head at the free end of the spindle that Davisson has shown his mesh-wire spools attached. Defendant attaches his mesh-wire spool to the other cross-head, namely to the gear wheel. In
366 both the Davisson patent and defendants' machine the mesh-wire spools are, therefore, revolved about the axis of the spindle by the same primary means, to wit, the gears. There is, consequently, no departure in defendants' machine from the Davisson invention as expressed in the two claims in suit.

Defendants' machine having these same essential elements of the Davisson structure and specified in the claims in suit, including the

series of hollow spindles arranged in a line, as shown in the Davisson patent, is capable of making and does in fact make the particular fabric above referred to and first producecable in the art by the Davisson machine. It is, therefore, the Davisson machine in essentials of structure and in product.

Q. 5. Have you examined carefully the testimony of Mr. Wiles concerning this Davisson patent and the opinions which he has expressed concerning the prior exhibits in their effect upon the validity or scope of the Davisson claims in suit and also in their bearing on the question of the correspondence of defendants' machine to the subject-matter of these claims, and do you find therein anything that, in your opinion, would tend either to restrict the Davisson claims or materially distinguish defendants' machine therefrom?

A. I have carefully read Mr. Wiles' discussion of the questions referred to, and find therein nothing whatever tending to show the Davisson patent to be anticipated or restricted, as to the claims in suit, by the prior art, and nothing whatever tending to show material difference between defendants' machine and that of the Davisson patent in so far as the two Davisson claims in suit are concerned.

Having pointed out in my last answer the fundamental elements and characteristics of machines in the prior art, and also the different fundamental and characteristic features of the Davisson patent, and shown conclusively, as I think, that Davisson's invention was a radical departure from what preceded it, I did not there think it necessary (though warranted by the question) to take up Mr. Wiles' discussion and comparison on this point. It is evident that, in his comparison of Davisson with the prior art, Mr. Wiles has wholly overlooked or disregarded general principles and broad distinctions and has contented himself with scratching in the surface of
367 the inquiry and has sought only for similarities in non-definitive details. It would not be agreeable to me to follow his footsteps in such a superficial and meaningless inquiry.

Complying with the question, however, I will take up the various exhibits to which Mr. Wiles refers, and briefly show that they furnish no basis whatever for his general conclusion adverse to the novelty of the Davisson invention. I can abbreviate my discussion somewhat by reference to the ample and clear statements of my colleague, Mr. See, with whom, in all that he says in detail concerning the machines of the prior art, I fully concur.

Mr. Wiles, in his special consideration of the Davisson patent, enlarges at great length upon the numerous details of the machine, many of which are obviously not at all involved in the claims in suit, and concludes his description with the following statement:

"The operation of the entire Davisson machine is in substance the same and produces the same result as that of the Nesmith machine or either of the Sedgwick machines above described; and while the parts of the Davisson machine are different in form and specific operation from those of either of the other machines referred to they correspond, each for each, in function and general operation to the parts of the Nesmith machine. The spindles of the Davisson machine correspond exactly in function and in their rotary move-

ment to the synchronously operated front and rear twisting gears of the Nesmith machine, each of the front gears of the Nesmith machine, with the corresponding gear at the rear of the machine and the gearing for connecting them positively, being a spindle, as completely and evidently in a mechanical sense, as any one of the spindles of the Davisson machine."

In his answer to X Q. 14, which asked which of the exhibits prior to the Davisson patent he regarded as most nearly or completely embodying the invention recited in the second and third claims of that patent, or exhibits the nearest approach thereto, Mr. Wiles replied: "The Nesmith patent No. 10,743." It is, therefore,
368 necessary to consider the Nesmith patent only, at length, in comparison with the Davisson patent in suit.

In our consideration of the Nesmith machine we have here the aid of a certified copy of what is left from the fire of the model filed by Nesmith with his application for this patent, and also certified copies of the full-sized drawings belonging to Nesmith's application.

The first thing to be observed is that Nesmith has the rotating gear twisters, of the radially slotted form, of the old art. These are seen at J J arranged in an intermeshing row across the rear portion of the right hand or front general part of his machine. In front of these slotted-gear twisters are arranged the necessary devices for holding the fabric or fabric wire while a new twist is being made; devices for seizing and drawing forward the fabric periodically, as mesh after mesh, it is made; a roller upon which the fabric is wound when made; devices for assisting in shifting the mesh wires from the slots of one alternate set of twisters to another, and gearing, cams, levers, etc., for giving the various movements belonging to these several parts. This portion of the Nesmith machine is comprehensible from the description given in the specification, and it is clear how the slotted twister gears, here first (in 1854) shown in the art of record, may, by two or more rotations while the wires are passing through the slots of alternate gears, to twist them together to form the junctions of the mesh wires with each other and with marginal straight wires at the edges of the fabric. It is also clear, how, after the gear twisters have made a transverse series of twists, they may be brought to rest and the wires then pushed out of those twister gears last in action into the slots of the alternate gears next to be brought into action and also how the fabric and the still unwoven wire may be drawn along between the times when the twists are made.

Of course, all the wires entering into the fabric in a machine having such twister gears *come from behind the gears* and pass through the slots of the latter, and of course they proceed from spools. To carry these spools and to give to them or to some of them such necessary motion as will prevent the wires from tangling with each other as the work proceeds, Nesmith provides his
369 machine with another part to carry and handle these supply spools. This second part of the machine is placed behind the twisters, (as a matter of course), and for convenience of construction

and, perhaps, with a view to convenience of substitution, Nesmith shows this rear spool-carrying portion of his machine as having a separate frame from that carrying the twisters and the other devices accompanying the twisters, above enumerated. Nesmith distinguishes these two principal parts of the machine by calling the front or twisting part the "twister" and the rear or spool-handling part the "feeder."

Adjourned to tomorrow morning at 9.30 o'clock.

FEBRUARY 2, 1899—9.30 o'clock a. m.

Met pursuant to adjournment; present: same as before.

The WITNESS (resuming): For the purposes of this comparison, it is quite immaterial what may be the precise construction or mode of operation of the devices in the "feeder" of the Nesmith machine. It is sufficient to know that at the best it can do no more than keep the various wires which it feeds to the twister gears from entanglement. Assuming it to be sufficient for this purpose, and we have in the Nesmith machine precisely what I have heretofore illustrated diagrammatically in the first illustration of prior machines with slotted twister gears. All the spools for the supply of all the wires of the fabric are arranged back of the twisters, which twisters, furthermore, are of the slotted-disk order, and for these reasons alone the difference between this Nesmith machine and the machine of the Davisson patent is fundamental. As a consequence, the Nesmith machine has, and can have, not the slightest bearing upon the question of novelty in the Davisson construction.

But defendants' expert has made reliance upon this mere "feeder" part of the Nesmith patent as furnishing the most complete approach to the Davisson entire machine, and he has produced what he understands to be a model of this Nesmith feeder. That is to say,
370 he seems sometimes to rely exclusively upon the feeder and sometimes to feel called upon to take in the twister gears of the twister part in order to make out the supposed resemblance. For example, to meet the two claims of the Davisson patent here in suit, it is, of course, necessary for Mr. Wiles to find spindles in the Nesmith machine, spindles being specified elements in said Davisson claims. Any man looking at the drawings or model of the Davisson machine, or even at the supposititious and wholly unauthorized model of the rear part of the Nesmith machine produced by Mr. Wiles, can see at a glance that there is nothing in either part of the Nesmith, or in both parts of it taken together, which answers in any sense to a spindle, hollow or otherwise. In the rear or "feeder" part of the machine there are two cross-rows of intermeshing slotted gears of equal diameter, and therefore in line with each other severally. The twister gears in the twister part of the machine are in the same horizontal plane with these slotted gears in the feeder, but the twisters are of less diameter than the feeder gears, and therefore said twisters are not all in line with the gears of the feeder. In fact, only one of them (the middle one) can be in line with said feeder gears. Moreover, the rows of gears of the feeder are entirely separate and

unconnected, and in a full-size machine will be about three feet apart. Similarly, the out-of-line twisters will in a full-size machine be about a foot and a half away from the front gears of the feeder and also wholly unconnected with the latter. Mr. Wiles says these out-of-line gears belonging to both parts of the machine, unconnected and separate from each other by the distances referred to, are spindles, "as completely and evident, in a mechanical sense, as any one of the spindles of the Davisson machine!"

It seems to me that such a proposition as this furnishes its own refutation. It is absurd on its face. To refer to only one fact in demonstration of the error or fallacy, I point out that the spindles of Davisson are straight, and necessarily so. If they were crooked or had different points in their length out of line, being rotary, portions of the spindles would swing around in orbits. If a bent tube were inserted through the axes of either outer pair of the Nesmith feeder gears and through the axis of the adjacent outer twister and made fast so as to rotate with these gears, there would be a
371 tendency to swing the front end of the tube (where I have supposed it to be connected with the twister gear), in an orbit. This would be impossible without throwing the said twister gear out of its place. But it is held in its place, and necessarily so, and consequently the introduction of such a crooked spindle would render the machine inoperative. This sufficiently shows, I think, that the spindle proposition of Mr. Wiles is absolutely without basis, and that we are left to the conclusion that the Nesmith machine does not, in the gears of the "feeder" taken in connection with the slotted twister gears of the "twister," contain anything answering to "a spindle * * * in a mechanical sense," or in any other sense, and that, in this respect, there is not the slightest correspondence between the Nesmith machine and the structure defined in either of the claims of the Davisson patent in suit.

But Mr. Wiles, at other times, leaves out the twister gears of the Nesmith "twister" and confines himself to the gears of the "feeder" to make out the spindle theory, and he furnishes on this point the drawing marked "Defendants' Exhibit Illustrative Drawing," in which he unwarrantably shows two adjacent front and two adjacent rear gears of the feeder having central openings and by dotted lines shows bars connecting a front with a corresponding rear one of these feeder gears. There is nothing like this in the Nesmith patent, and in view of the obscurity of said patent as to the actual construction, it is not certain that such imaginary connecting bar could possibly be used in the Nesmith construction. But suppose it could be used, and for the sake of Mr. Wiles' argument let it be admitted that such front and rear gears of the feeder answer to spindles, they are necessarily restricted in situation and function to the "feeder" of the machine. That is to say, they are behind the twister gears, are unconnected with the twisters, have nothing whatever to do with the twisting by the twisters, and are concerned solely in preventing entanglement of the wires which are being fed to the twisters in front of them. They are therefore not the spindles of the Davisson patent, which project forward from the merely impelling gears of

the Davisson machine and which, on the other hand, have nothing to do with the feeding of wires from the rear or the prevention of entanglement of such rear-fed wires.

372 This "Defendants' Exhibit Illustrative Drawing," presented by Mr. Wiles, clearly refutes his other proposition, above referred to, in which he proposes the inclusion of the twister gears in the allleged spindles of the Nesmith machine because it makes evident the impossibility of connecting an out-of-line twister gear with the front one of the two bar-connected feeder gears, shown in that drawing, by similar connecting bars.

Wherefore, the pretended discovery of the spindles of the Davisson patent in the Nesmith machine by Mr. Wiles, is baseless, and there is nothing of the sort in said Nesmith machine, in structure, function or mode of operation. The Nesmith patent is obscure in some things and is wholly wanting or insufficient in other respects, but it is clear in this, that the front part of the machine is the twister, that the rear part of the machine is not the twister, but is solely a feeder, and that the production of a fabric cannot be made by either part of the machine alone, but requires the whole. The specification says, page 1, column 1, second paragraph:

"Of the said drawings, Fig. 1 denotes a plan. Fig. 2 denotes a side elevation. Fig. 3 denotes an elevation of *one of the parts* of my setting machine, which may be called the '*feeder*.' Fig. 4 is an elevation of *the other principal part* of my machine, which I call the '*twister*.' Figs. 3 and 4 show the two principal parts of the said machine as disconnected from each other, or an inside view or elevation of each part when they are connected to each other."

Both Fig. 1 (the plain view) and Fig. 2 (the side elevation) show the two "principal parts" of the machine connected together. The Patent Office model here in evidence shows the two principal parts of the machine placed on the floor in their proper relation ready to be connected together by the shafts and gearing, some of which are absent from that model, but all of which are shown in Figs. 1 and 2 of the patent drawings.

The front principal part of the Nesmith machine, to wit, the "twister," is an adequate twister of the slotted-gear type, provided some suitable mechanism be employed back of the gear

373 twisters for the purpose of supplying all the wires entering into the fabric and, at the same time, preventing said wires from becoming entangled with each other during the operation of twisting. Mr. Nesmith asserts that his principal invention is in the feeding mechanism for thus supplying the wires and at the same time preventing their entanglement. He says (page 1, paragraph 3): "The principal and main features of novelty of my invention consist in the revolving of the wires parallel with each other at the same time that they are being twisted, and the other parts and movements of my machine to produce the effect hereinafter described." The first part of this statement has reference to the "feeder" mechanism exclusively. By this feeder the wires being fed forward to the twisters are to be revolved and kept parallel with each other while they are also being revolved by the disk

twisters themselves. Thus entanglement of the wires back of the twisters will be prevented. There is no pretense made by Nesmith that the "feeder" of his machine will, or can, do any twisting, but only that it will keep the wires parallel while they are being fed forward through the actual twisters in the other principal part of his machine. Moreover, it is perfectly plain to a mechanic that the feeder of the Nesmith patent cannot act as a twister or produce a fabric. The production by defendants' expert of the segregated rear part or mere feeder of the Nesmith machine, even if it were correctly constructed, as a representation of the Nesmith invention, or as by any possibility representing a complete fabric-making machine or as anticipating or having other bearing upon the twister of any other machine, striking me as preposterous and absurd. Even if it had anything like the devices in the Davisson patent, to which it is cited especially, it could not, in my judgment, forestall invention on the part of Davisson, who was the first to abolish "feeders" altogether; who was the first to abandon gear twisters; who was the first to make the mesh-wire supply spools the actual twisters, and who thus revolutionized the whole art of wire-netting machines in its fundamental principles, construction and mode of operation, to say nothing on the here disputed question of his having made possible a new and superior form of fabric, and nothing of the undisputed fact that he made a portable field-fence-making machine productive of this product, possible.

374 "Defendants' Exhibit Nesmith Model" is not what it purports to be in its title, not only because it pertains to the "feeder" exclusively and altogether omits the twister of the Nesmith machine, but because it contains features not present in the Nesmith machine or patent and other features not disclosed, described or shown in the Nesmith patent, whatever may have been the fact as to any Nesmith machine which may have been built.

First referring to the central holes shown in this misnamed "Defendants' Exhibit Nesmith Model" through all the feeder gears, I consider these holes to be practically in direct contradiction of the terms of the Nesmith patent, except as to those through the outermost gears. The Nesmith patent warrants the holes through the outer gears, but does not warrant the holes through the intermediate gears. The difference between the patent and the alleged model in this respect has this significance, namely, that with holes through the outermost gears only (corresponding holes being made through the outermost twister gears in the other part of the machine) permit the introduction of special marginal wires on both edges of the full-width fabric or on one edge only of a narrower fabric, while the further provision of holes through the intermediate gears permits the making of a fabric with any number of intermediate tension wires embraced in the converging twists of the mesh wires (being the fabric which I believe was first produceable by the Davisson machine and which is first shown in the art in Figs. 10 and 11 of the Kitselman patent) and also permits the making of other than full-width fabrics with special marginal wires on both edges of the fabric.

The most specific statement of the Nesmith patent with reference to holes through the various gears is found near the top of column 2 of page 2, as follows:

"The two outside or border wires never move transversely, but move longitudinally, like the other wires, except that they pass through holes drilled in the center of the *four* outside feeding gears and the *two* outside twisting gears. The two outside small wires are wound twice around the border wires, at every
375 other twisting operation, as will be seen by inspection of Fig. 1."

Just above the middle of column 2, page 1, the specification had previously said concerning this matter:

"The border wire to netting and top and bottom wire in fence is usually made larger than the wire to be twisted, although the wires can all be of the same size, if desired. The wire [the border wire] is place- upon the reels C C, Fig. 1, and then one end of the same is passed through a hole which is drilled in the center of the four outside gears E E and X X, Fig. 1 [gears of the feeder]. The said wires are then passed to the twisting part of the machine, and through holes drilled in the center of the two outside twisting gears J J, Fig. 1. Then the said [border] wire is passed between the jaws G G, Fig. 2, and then to the cylinder II, as seen at Figs. 1 and 2, and firmly secured to the same by a clamp *g* and a catch *y*, which can be seen at Figs. 1 and 2, then the wire is to be twisted [the intermediate mesh wire] (which) are wound upon or around the reels D D D D, Fig. 1. Said reels are then placed upon the stand I I I I, Figs. 1 and 2, on which they revolve as the wire is being drawn off from them. One end of the [mesh] wire on each of the four reels D D D D is then passed through one end of the reel stand I I I I, Fig. 1, thence to and through the slots in the twisting gears J J J J, Fig. 1, and then they are passed between the jaws G G Fig. 2, and thence to the cylinder II, Figs. 1 and 2, and secured to the said cylinder by the same contrivance by the border wire before described."

Figure 1, agreeably with the foregoing statements of the specification, shows the heavier border wires passing through the centers of the "four outside feeding gears" and through the centers of the "two outside twisting gears." By reference to the certified Patent Office model, in evidence, it will also be seen that only the "four outside feeding gears and the two outside twisting gears" have such
376 central holes. Moreover, the patent and model both show only two border-wire reels C C fixed at the extreme rear of the feeder.

Nor is there a single word in the Nesmith specification even hinting at the presence of such central holes through any other than these specifically named six feeding and twisting gears.

Reference has been made to the following words found at the top of column 2, page 1, of the specification—"and any width of the netting less than the whole scope of the machine can be made by simply drawing in the number of wires desired." Concerning the purport of these words, it is to be borne in mind that special heavy border wires were not a necessity and that fabric otherwise quite

identical could be made from the smaller mesh wires by stringing one of such regular wires through the outer slot of the twisting gears, this wire, or these wires, coming out straight in the fabric, because never deflected inwardly to be twisted with the second mesh wire from the edge. This sort of a fabric, that is, one not having special heavy border wires, is clearly contemplated in claim 6 of the Nesmith patent, as shown by the words:

"The feeding and twisting gears, with or *without* their centers perforated to admit the border or warp wires passing through the same."

Hence, when Nesmith says "any width of netting less than the whole scope of the machine can be made by simply drawing in the number of wires desired," he in nowise declares or implies that warp border wires running through central holes of the gears are necessarily contemplated, and there is consequently no implication in this statement that in any case he contemplated the provision of central holes through other than the six outside feeding and twisting gears which he specifically named. There is therefore no declared or implied capability on the part of the Nesmith machine for making the particular new fabric first shown in the art in the Kitselman patent and first clearly made possible of construction by the Davisson machine.

The "Defendants' Exhibit Nesmith Model" is therefore without warrant as to the central holes through the intermediate feeder and twister gears, and said so-called model is in this particular also a misrepresentation of the structure shown in the Nesmith patent.

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Said "Defendants' Exhibit Nesmith Model" shows with great perfection of detail bars or "reel stands" mounted to slide at their ends in and out of the radial slots provided in the feeder gears and carrying spools or reels for the mesh or woof wires, and with these stands are combined shifting wedges by which the stands may be transferred from the slots of one pair of feeder gears to the slots of an adjacent pair. This *may be* the construction and arrangement actually contemplated by Nesmith, and it may not be. The patent gives no adequate information on this point. In view of the radical and fundamental differences already pointed out between the Nesmith machine and that of the Davisson patent, it is, of course, quite immaterial whether "Defendants' Exhibit Nesmith Model" shows the mounting and management of the mesh-wire reel stands which Nesmith had in mind, or not. The precise question now being considered is the propriety of this so-called model. Every word contained in the body of the Nesmith specification concerning the mesh-wire spools or reels and concerning the "reel stands" upon which the reels are placed is contained in the following quotation, beginning just below the middle of column 2, page 1:

"then the wires to be twisted are wound upon or around the reels D D D D, Fig. 1. Said reels are then placed upon the stand I I I I, Figs. 1 and 2, on which they revolve as the wire is being drawn off from them. One end of the wire on each of the four reels D D D D

is then passed through one end of the reel stand I I I I, Fig. 1, thence to and through the slots of the twisting gears * * *

"The reel stands I I I I, Fig. 1, have each a spring on the side next the reel, the object being to produce friction and to prevent the wire from coming off the reels too easily."

The foregoing can surely not be regarded as adequate warrant for the construction and combination of reel stands, feeder gears
378 and wedge-shaped shippers introduced into "Defendants' Exhibit Nesmith Model." I next quote from the patent all those statements found in the body of the specification which may be supposed to imply something concerning these parts. Beginning near the bottom of page 1, column 2, the specification says:

"The shippers, Figs. 1 and 2, being first raised by the cam R B^8 and U U Fig. 2, operating against or raising the levers T T, which were shown in Fig. 2, it being understood that the shippers S S in the twisting part of my machine act in concert with and simultaneously with the shippers S S in the feeding part of my machine. By this movement they are brought into the position as shown in Fig. 2 of the drawings, and then stop moving, and as soon as the movement of the said shippers ceases the twisting gears J J J J J Fig. 1 and the feeding gears E E E E E and X X X X X, as seen at Fig. 1, make two revolutions, they revolving exactly with each other, so as to keep the wires parallel and from getting tangled with each other, two revolutions of the said gears being all the twisting that is necessary at each end of the meshes in the netting and fence for making good substantial work."

"The before-mentioned gears J J J J J [twisters] and E E E E E and X X X X X [feeder] after making two revolutions, as before stated, cease moving, * * * and as the said twisting and feeding gears stop revolving in such position that the slots in the said gears are on a line with each other, so that the *wires* can be shipped from one set of gears to the others by the shippers S S S S, Figs. 1, 2, 3 and 4, and so that the *wires* can be shipped back from one set of gears to the other by the shippers V V V V, Figs. 1, 2, 3 and 4, it being understood that the said feeding and twisting gears revolve and stop alternately—that is, they revolve when the shippers cease moving, and that the shippers perform their duty while the said gears remain motionless, * * * and when the wire is so drawn forward [by the jaws G G] and the jaws G G stop, then the shippers S S S S, Figs. 1, 2, 3 and 4—that is, one of the two sets of
379 shippers on each side of the shipper frame and one of the two sets of shippers Figs. 1 and 4 on each side of the twisting gears—are first raised by the cams R and U, said shippers then remaining in this position until the wire is sufficiently twisted. Then they are depressed or moved downward to their lowest position, as seen at V V V V Fig. 2. Then the said set of shippers V V V V Fig. 2 on each side of the frame B [feeder frame] and each side of the twisting gears J J J J are moved upward by the cams R and U by the same operation as the shippers S S S S, before described, and by the upward movement of the said shippers V V V V, the *wires*

are shipped from the position in which they were left by the shippers S S S S to the other feeding and twisting gears, as will be readily understood by an inspection of the drawings—that is, one set of shippers move the four inside *wires* one way and the other set of shippers will move the four inside wires the other way at the required time to harmonize with the other correct movements of the machine. The two outside or border wires never move transversely" (etc., as before quoted).

It will be observed from the foregoing exhaustive quotations from the patent that it is nowhere stated that the ends of the reel stands I I enter the notches or radial slots formed in the feeder gears, as they are shown to do in "Defendants' Exhibit Nesmith Model," and the drawings of the Nesmith patent, even the full-size drawings introduced as "Complainants' Exhibit Nesmith Drawings," do not show such extension of the reel stands I into the slots of the feeder gears. The certified remains of the Nesmith model do not show the reel stands at all, and there is, hence, nothing in these records to authorize this feature of said "Defendants' Exhibit Nesmith Model." The drawings of the patent and the certified Patent Office model do, however, show something which appears to be concerned in the support of the reel stands in some unexplained and unillustrated manner, from the feeder gears. I refer to the studs seen in the Patent Office model to project from the inner faces of the feeder gears,
380 said studs in the model having originally been all provided, doubtless, with plate springs such as are still left in three of the feeder gears of the model. These studs and springs are omitted from "Defendants' Exhibit Nesmith Model."

There is one claim of the patent, to wit, claim 6, which appears to touch upon this subject, and it is evident that defendants' expert in preparing the said "Defendants' Exhibit Nesmith Model" and finding in the description and drawings of the patent, or even in the Patent Office model (if that was inspected), no indication of how the reel stands I I were supported from the feeder gears, fell back on this claim 6, as perhaps suggesting an inference. Said claim reads as follows:

"6. The feeding and twisting gears, with or without their centers perforated to admit the border or warp wire passing through the same, and the said gears having slots cut in them, for the receiving and sliding of the *ends of the stands* and wires in the same, substantially as hereinbefore set forth and specified."

There is nothing "hereinbefore set forth and specified" about the matter, and this claim, whatever it means, contains absolutely every word present in the patent and every indication contained in the patent specification or drawing, bearing on the question how or where the reel stands engage with or are supported by the feeder gears. Assuming that a claim of a patent may furnish the only indication of a vital feature of construction in a machine, the drawings and description failing utterly to disclose it, I do not look upon this claim as affording a sufficient supplement to the defective description and illustrations to warrant the construction found in "Defendants' Exhibit Nesmith Model," and in the absence of parts lost

by the fire in the Patent Office from the certified model, I do not believe it possible to actually determine from said model, taken in connection with the Nesmith patent drawings and specification, precisely what the construction originally shown in said Patent Office model was (supposing it to have ever been complete), or what was the actual construction in this respect of the Nesmith ma-
381 chine (if it was ever built), or what operative construction Nesmith may have had in mind (if he ever had any), in this particular.

I therefore regard "Defendants' Exhibit Nesmith Model," purporting to show the feeder mechanism of the Nesmith patent, as unreliable with respect to the mounting of the mesh-wire reel stands or bars; as positively contrary to the patent with respect to the central holes through the intermediate gears of the feeder and twister; and as in any case not a representative of the Nesmith machine as by its title it purports to be. But, closing with this model as I began, I consider it wholly immaterial and destitute of the slightest relevance to the Davisson patent and invention because it neither contains nor suggests the fundamentally new departure in the art of making wire fabrics, presented in the Davisson patent, but, on the other hand, pertains to a secondary, though necessary, part of the machine of the old art, which part Davisson obliterated from his own machine by the transformation which he effected and by the novelty in construction and functions of parts which he introduced.

It is enough to say of the machines of the Whitehead publication or British provisional specification, of the British Smith publication or provisional specification, of the Sawyer U. S. patent and of the two Sedgwick patents, that they are of the same general character and type as the machine of the Nesmith patent. That is to say, they have all either slotted or divided gear twisters through which all the wires of the fabric pass from behind them, and all have some sort of contrivance back of these disk twisters by which said wires are prevented from back-twisting or entangling with each other as the twister disks are rotated. The Davisson invention is therefore as broadly distinguishable from each and all these prior devices as from the Nesmith and each and all of these prior devices may be assumed to be entirely operative (contrary to the fact as to the two British publications, at least), without in the least affecting the attitude of Davisson as a pioneer inventor and a radical revolutionist in the art. The Davisson claims in suit are, in my judgment, rather broadened than limited by consideration of what precedes the Davisson patent in the art.

Adjourned until tomorrow morning at 10 o'clock.

382 FEBRUARY 3, 1899—10 o'clock a. m.

Met pursuant to adjournment; present: Same as before.

Examination of MELVILLE E. DAYTON continued:

Q. 6. Have you examined the prior patents and other exhibits here in evidence with reference to the question whether they exhibit

mechanisms corresponding substantially to that shown and described in the Kitselman patent and recited in the 1st, 2nd, 9th, 10th, 11th, 15th and 20th claims thereof, and also with reference to the question whether anything exhibited in the prior art or mentioned or suggested in the deposition of Mr. Wiles would tend to limit or modify those claims within the scope attributed to them in your former testimony? If you have done so, please state whether or not you find in any of the prior exhibits, either disclosed, suggested or described, the subject-matter of either of these claims, or anything substantially similar thereto; also whether or not you find in any of them anything which, in your opinion, would materially limit or qualify these claims or modify the opinions which you have heretofore expressed concerning the correspondence of defendants' machine with the subject-matter embraced in these claims, giving your reasons for such opinions as you may express.

A. I have examined the prior patents and other exhibits here in evidence with reference to the two questions referred to in the interrogatory, and reply that I have not found in said patents or exhibits anything corresponding substantially with the mechanisms described in the Kitselman patent and recited in the claims referred to, and have also not found anything in said prior patents or exhibits, whether mentioned or not in the deposition of Mr. Wiles, that, in my judgment, tends to limit or modify those claims to a narrower scope than that attributed to them in my former testimony. I have also compared said claims of the Kitselman patent with the prior art and the prior art with defendants' machine, in the light of all that Mr. Wiles has said concerning them severally, and I find nothing in the prior art or in Mr. Wiles' deposition which materially modifies the opinions I have heretofore expressed concerning the correspondence of defendants' machine with the subject-matter of the said Kitselman claims.

383 Giving my reasons for these conclusions, the first proposition I make is that the Kitselman is manifestly, on its face, a development of the Davisson invention, and is therefore necessarily as clearly distinguished from all the art prior to the Davisson patent as is the Davisson invention itself. This proposition being recognized as sound, it follows logically, it seems to me, that the only prior art that can have a bearing upon Kitselman is the Davisson patent itself, from which the Kitselman invention proceeds.

I am aware that Mr. Wiles brings into this question of novelty in the Kitselman patent a number of prior patents showing portable machines for making an entirely different kind of fencing in the field, to wit, wooden picket fencing having the pickets twisted into pairs of longitudinal wires. In my judgment these cut no figure on the question of novelty or invention in the Kitselman patent or machine and at best can be credited with nothing more than suggesting to Kitselman the desirability of making an invention by which the wholly different kind of fencing producea*b*le by the Davisson patent might be constructed *in situ*. Mr. Wiles says, "Furthermore, Kitselman was not the originator of the idea of a field machine for building wire fence in the field," and to give reason for this under-

standing of the fact, he adds, "A well-known form of fencing made long before Kitselman's invention was that in which longitudinal pairs of wires were intertwisted with vertical slats or pickets inserted between the twists, at suitable intervals." This was not a "wire fence," it was a wooden picket fence. Wires only took the place of the horizontal bars to which the same wooden pickets had been previously nailed. Hence, according to Mr. Wiles' own reason for his statement that Kitselman was not the first to build wire fence in the field, said statement is incorrect. I therefore point out as a fact that Kitselman, so far as this record goes, was apparently "the originator of the idea of a field machine for building wire fence in the field," and, so far as this record shows, or I am aware, the Kitselman machine set forth in this patent in suit was actually the first ever invented or constructed by which a wire fence could be made in the field.

There never was any confusion among users or purchasers as to whether the wooden picket fence with twisted wire stringers
384 was a wire fence. It had a distinctive name in the art by which it was clearly distinguished from the wire fencing previously woven on stationary looms exclusively and largely used prior to the introduction of the said picket fence. This record shows the Nesmith patent for making wire fencing as far back as 1854. Some of the patents in evidence relating to the fencing constituted of wooden pickets and twisted wire stringers, define that product in quotation-marks as "wire and picket fencing," showing that it had a technical name perfectly distinguishing it from "wire netting" or "wire fencing."

Mr. Wiles urges that the Kitselman patent contains no claim for a portable machine adapted to make wire fencing in the field. It is true that none of the claims in suit specifies in terms the portability of the machine, and in my judgment it is not necessary that it should do so. It is sufficient, in my understanding, if the claims specify features of construction and combinations of parts by which a portable machine is produced. The Kitselman claims specify such features and combinations.

With respect to the field machines for making "wire-and-picket" fencing, it is also, in my judgment, sufficient to point to the evident fact that none of them is capable of making a "wire fence" and none of them contains those features and combinations of the Kitselman machine and claims in suit by which said machine does make a wire fence in the field. Mr. Wiles admits that these portable "wire-and-picket" fence machines could not make a purely wire fabric of any kind. He says of them that:

"The operating parts were adapted for the manufacture of the particular fencing which the machines were intended to make; and they were not capable of making the diamond-mesh fencing which is manufactured by the defendants' machine herein or by the machines shown by the patents in suit."

He rests his judgment as to their pertinency to the Kitselman invention solely upon the fact that they are portable machines for the

purpose of making something in the nature of a fence, and so says immediately after the above quotation:

385 "So far as the feature of adaptability to use in the field is concerned, they fully anticipate any possible invention in the Kitselman machine."

In my judgment Mr. Wiles might have cited anything else that was portable, with no less and no more propriety, as a basis for this conclusion. For example, he might have cited a corn-husker or a corn-sheller, adapted to be operated in the field, such machine having been first made exclusively for use in the barn, with just as much force as he here cites these portable "wire-and-picket" fence patents and machines. A portable corn-sheller is no more incapable of making a strictly wire fence than is either of these cited picket-fence machines.

If no one of these "wire-and-picket" fence machines could make a diamond-mesh wire fence in the field and no other machine had existed which could be used for making such a wire fence in the field, it seems to me that the presumption should be that Kitselman, who was the first to construct a machine adapted for that purpose, made and must have made an invention in accomplishing that result. But it is not necessary to rely upon such a presumption. The fact that Kitselman made an invention in the production of this first machine for that purpose is shown, I think, by the comparison of his machine with what went before it in the way of machines for making the same or analogous wire fabrics.

Making this comparison, it is my judgment that he could not have adapted, and no one else could have adapted, the type of wire-netting machine known prior to Davisson to portable use. The employment of disk twisters, either slotted or divided and perforated, necessarily accompanied by the arrangement of all the supply-spools back of the twisters and necessarily accompanied by contrivances for their revolution in this old situation to prevent entanglement of the wires back of the twisters, in my judgment precluded the production of a practical, portable field machine for making a diamond-mesh wire fabric. The Davisson invention, revolutionizing or abandoning prior principles of construction, arrangement and operation, first made the portable or field wire fence machine possible or practicable, in my opinion, and it is by reason of Kitselman's employment of the underlying principles of the Davisson

386 invention, and by the addition of his own invention thereto, that such a field wire fence machine was, in fact, made, for the first time in the art, by him.

Wherefore, notwithstanding Kitselman's patent contains no claim in terms specifying a portable or field wire fence machine, I repeat from my former deposition the statement of opinion that all his claims for features of construction and combinations of parts contributing to the portability or field usefulness of his machine acquire dignity and special significance from the fact that he is the first in the art to have made a portable field machine for the manufacture of wire fencing. And it does not lessen the dignity of this Kitselman invention or the significance of said claims, in my judg-

ment, if it be true that Kitselman may have derived some hint or aid from the cited wire-and-picket fence machines, or patents, or from any other portable machine or patents, with respect to such minor features as pertain to the movement of the machine along the ground and similar matter. The sole question, in my judgment, is whether Kitselman made any invention over the Davisson patent, and there is, in my opinion, no other question to be considered in determining the novelty of the subjects-matter of the Kitselman claims in suit.

Before taking up this question in connection with Mr. Wiles' deposition, I refer to one of the earliest portable fence-machine patents cited by defendants as showing that this sort of wood picket twisted wire stringer fence was already known in the art (it having been long previously made by stationary machinery) by the name I have given it, to wit, "wire-and-picket" fencing. The Middaugh & Willcox patent, dated December 23, 1884, contains this statement:

"This invention relates to machines for building or constructing that class of fences which are known as 'wire-and-picket' fences, and which consists of pickets or palings connected by twisted or woven wire."

There is no weave other than the mere twist between the two wires of each pair of stringers, by which the wooden pickets or palings are secured and confined, and this statement of the Middaugh & Willcox patent, therefore, means only that the "pickets or
387 palings" are connected by twisted wire. I also here add in repetition of a statement in my former deposition that the pickets or palings in these "wire-and-picket" fences, as made by these portable machines cited, are inserted by hand and not by the machine. The machine is therefore merely a wire twister, and is hence, for this reason, still more remote from the Kitselman invention and destitute of suggestion of the latter. The pickets being inserted by hand, they are of course not necessarily always of wood. They may be straight metal rods, or heavy wires, so that the completed fence will be exclusively a metal fence. But this makes no difference with respect to the conclusions above expressed, since the machine itself does not form or introduce the pickets, whether of metal or of wood, so that if such pickets, inserted by hand, be actually of wire or metal rods, the product or fencing produced, though allowably called a metal fencing or even a wire fencing, is not a metal or wire fencing *made by the machine*, which, as stated, merely performs the simple work of twisting one or more pairs of longitudinal wires, back and forth, between hand-inserted pickets.

With these remarks, I think the entire list of portable fence machines cited by defendants may be dismissed from consideration and the comparison of Kitselman with Davisson taken up.

In Mr. Wiles' lengthy description of the Kitselman machine in which he elaborately points out all the details of the Kitselman invention as specifically illustrated in his patent and exhibit machine, I notice that he frequently refers to the "rotating spindles" and to the "forward extensions of the rotating spindles" of that patent and machine. It is thus admitted that Kitselman has the spindles of the

Davisson invention. Davisson's spindles are also, manifestly, the "hollow spindles" of the Davisson invention. Mr. Wiles also recognizes in the Kitselman machine the feature, new with Davisson, of making the mesh-wire spools direct twister elements by placing them in front of the rotating gears and alongside of the spindles which extend forward from said gears, where he says of the Kitselman construction:

"It is clear that the rotation of any given spindle and its
388 extension, with two spool-carriers lying on opposite sides of the extension and in connection therewith, must intertwist the woof wires from the two spools, at a point in front of the front end of the spindle extension."

Adjourned until March 6, 1899, at 11 o'clock a. m.

MARCH 6, 1899—11 o'clock a. m.

Met pursuant to adjournment; present: same as before.

The WITNESS (resuming): The Kitselman machine thus admittedly having hollow spindles for warp wires, which were new with Davisson, and also having the weft or mesh wire spools arranged alongside these spindles and in front of the gears by which said spools are revolved about the warp wires, also new with Davisson, and making the mesh-wire spools direct and active agents in the twisting operation, as Davisson was the first to do, omitting altogether the disk form of twister known to the art prior to Davisson and, of course, omitting all those older devices accompanying the disk form of twister situated back of the twister disks and serving to keep the wires from entanglement on their way to the disk twisters, it is plain that Kitselman proceeds directly from Davisson and that the art prior to Davisson is necessarily as irrelevant to Kitselman as to Davisson. It is therefore necessary to consider only the Davisson patent in discussing the question of novelty or invention in the subject-matter of the Kitselman claims in suit.

In my *prima facie* deposition I pointed out five principal changes which Kitselman made from the Davisson machine. Briefly re-enumerated, they are the following: First, Kitselman made Davisson's spindles longitudinally stationary, thus eliminating the machinery employed by Davisson for sliding them back and forth in the direction of their length. Second, Kitselman set the mesh-wire spools back with reference to the front end of the spindles, thereby bringing the ends of the hollow spindles into action as supports for the warp or tension wires of the fabric at the points where the twisting is accomplished by the mesh wire spools. Third, Kitselman inter-
meshed the gears for revolving the mesh-wire spools directly
389 with each other, thus dispensing with separate racks and with the machinery for actuating such racks that Davisson employed, and permitting the entire series of gears and twisters to be simultaneously rotated by a single hand crank. Fourth, Kitselman arranged the series of hollow spindles in a vertical portable frame, which he was enabled to do by the elimination of the mechanism for reciprocating the spindles and the mechanism embracing

the racks and devices for reciprocating the latter, used by Davisson. I regard these changes as involving patentable matter, the more pronouncedly because they resulted in begetting a machine adapted to produce this fencing in standing position in the field and thus enlarging its usefulness and value. This capability was not possessed by the Davisson machine, although, as I have heretofore stated, the radical invention of Davisson made the result possible at the hands of Kitselman or of any other inventor who might have apprehended the possibilities opened up by Davisson and who might have possessed the ability to make the further inventions necessary to the result.

And it seems to me in no way derogatory to the Kitselman invention that he may have derived a suggestion as to the desirability of a portable machine from his possible knowledge of the existence of portable machines for making wire-and-picket fences in the field, or that he may have found in early wire-netting machines of the loom form a series of twisting gears intermeshed directly with each other. The problem before him was really the adaptation of the Davisson machine to produce its diamond-mesh fabric having tension wires distributed throughout the fabric and passing through the twisted intersections of the meshes, and this problem he solved by the combinations of devices specified in his claims.

Defendants' expert, Mr. Wiles, cites generally to the Kitselman patent the Whitehead British provisional specification, the Nesmith U. S. patent, the Davisson patent in suit and the Smith British provisional specification. More specifically, he cites the Davisson patent to claim 1 of Kitselman and the Nesmith patent, along with Davisson, to the other claims of the Kitselman patent, in suit.

In making these citations, Mr. Wiles failed altogether to recog-
nize the vital differences between the Davisson machine and
390 the prior Whitehead, Nesmith and Smith constructions,
as such differences have been pointed out in this deposition and in that of my colleague, Mr. See. The Whitehead specification shows and describes twisters of the divided-disk form, accompanied by an arrangement of feeder spools and bobbins all back of the disk twisters and intended only to keep the wires from entanglement while being supplied to the twisters. Such divided-disk twisters were moreover purely two-part twisters, and for this reason, if for no other, can have no relevancy to the three-part twisters of the Kitselman machine and claims. To be entirely fair to Mr. Wiles, I do not understand him to urge the Whitehead provisional specification as having any correspondence with Kitselman after all, except in a single detail. Having reference to the vertically sliding shifting bars in the Kitselman machine for transferring the outside sections of the twisters up and down, he says:

"The means used in the machine for shifting the parts of the twisters will be recognized at once as the same shown and described in the British patent of 1854 to Whitehead; and there is evidently no novelty whatever in these elements of the Kitselman machine."

It is true that Fig. 1, plate 2, and Fig. 1, plate 4, of the Whitehead provisional drawing, show oppositely reciprocating bars having

semicircular recesses intended to shift the halves of the divided twister disks shown in said drawing, and that these recessed bars, considered by themselves, correspond essentially with the similarly recessed bars present in the Kitselman machine. But in the Kitselman machine said bars, or their equivalents, are elements of combinations not present in the Whitehead provisional specification, and the claims of the Kitselman patent, are therefore unaffected by this incidental fact of their presence in the Whitehead publication. Indeed, it will be seen that no one of the Kitselman claims in suit specifies these shifting bars, or any other shifting mechanism. Said claims speak of "the shifting sections" of the twisters, said shifting sections being said to be "for carrying the weft wire," as claim 1 puts it, and the same shiftability of these sections is otherwise referred to in some of the other claims in suit, but the
391 means for shifting said sections of the twister is not made a named element, I believe, in any claim sued on. For this reason, it seems to me that the above-quoted reference by Mr. Wiles to the Whitehead provisional specification has no significance whatever.

As to the Nesmith machine and patent, I have already at considerable length pointed out that it has no correspondence with the Davisson construction, and, the Kitselman being fundamentally the Davisson with the addition of the Kitselman improvements, said Nesmith machine and patent can have no real pertinence to the Kitselman claims in suit.

Leaving the Davisson patent for later consideration, I next take up the British provisional specification to Smith, which has no drawings and the full text of which was quoted by Mr. Wiles. Of this Smith provisional specification I do not hesitate to say that while clearly enough proposing in terms to make a fabric having warp or tension wires running through the twists and meshes, it fails utterly to give any adequate idea to a mechanic of any mechanism, practical or otherwise, for producing such a fabric. The twenty printed lines embracing the essential matter of the specification, or the thirty-one printed lines embracing the entire specification, title and all, are utterly unintelligible to a mechanic, beyond the bare proposition as to the kind of fabric which Smith had in mind. Mr. Wiles has said, rather dubiously it seems to me, in answer to redirect question 45 (in which he was asked to state "whether or not the various patents that you have considered on your examination illustrating the prior art are, in your opinion, sufficiently full, explicit and plain in their illustrations and descriptions as to be understood by one skilled in the art, and whether or not, in your opinion, they illustrate and describe practical and operative machines:")

"I should say from my examination of all the patents of the prior art, except perhaps the British provisional specification of 1876, that each of them shows a machine adapted to operate in accordance with the explanation in the specification. The British patent of 1876 suggests and clearly outlines, in general terms, a construc-

tion not up to that time illustrated in the prior art; and the
392 patent itself has no illustrative drawings. In my opinion, however, as I have said before, a mechanic skilled in the art and familiar with the Whitehead British patent of 1854 and the Nesmith U. S. patent of 1854, might have built a machine embodying the briefly described construction of the British patent of 1876, without the exercise of invention.

"All the patents of the prior art are clearly and easily comprehensible; and the description and illustration of each of them, with the exception of the British patent of 1876, is also sufficient to give a full understanding of the machine of the patent."

The fact is that the Whitehead provisional specification does not show an operative construction of the divided twister disk order, as my colleague Mr. See has fully and conclusively shown. But, assuming operative devices for actuating and, especially, for shifting the half gears of a machine having the divided gears of the Whitehead specification, to have been old and well known by Smith at the date of his provisional specification, to wit, 1876, there is nothing in the entire Smith specification that will enable a mechanic to modify the Whitehead construction so as to give the result which the Smith specification attempts to indicate or to produce the fabric referred to by Smith.

The part of the Smith specification regarded by Mr. Wiles as pertinent to this case and, especially, to the Kitselman patent, is contained in four lines, which read as follows:

"Or I divide the twisting reels into two parts, my extra wire passing through the central division, and the two side segments travel to and fro to form the twist, leaving the central division in position with my supplementary wire therein maintained."

There is no illustration in the form of a drawing and not another word descriptive of the construction beyond those just quoted. No form of machine is shown in the prior art for making the fabric here contemplated, and it is not pretended by Mr. Wiles that the reader of this Smith specification has any-
393 thing to aid him beyond the plain two-part divided gear twister wheels of the Whitehead specification. I confess that with my experience as a mechanic, as an inventor and as a student and writer of patent specifications, I am unable to conceive, from this four-line description alone, how a machine having the three-part twister disks would be constructed, or how Smith may possibly have thought of constructing it. The moment the mechanical or inventive mind begins to embody the idea, it encounters questions and problems at once calling for invention. And when the thing is invented there is no certainty that it is the construction possibly thought of by Smith because Smith fails to state his construction. With Kitselman's invention before us, we naturally run the Smith idea along the Kitselman lines, but if we had no Kitselman invention before us it is not certain what direction the mind would take. But the fact that, in an attempt to realize an embodiment of the Smith proposition, we run into the Kitselman scheme does not seem to me an indication that Smith's four-line proposal constitutes a dis-

closure of Kitselman's construction, but rather that the Kitselman patent or machine is necessary to an understanding of how the Smith proposition may be embodied and that the bare statement of the proposition itself does not suggest the embodiment.

I do not mean to be understood that any embodiment of the Smith idea would give the Kitselman construction, as the last sentence might be taken to imply, since the Smith construction, whatever it may have been in Smith's mind, would still have been of that old order in which all the supply spools, those for the mesh wires as well as those for the tension wires, would have been back of the twister gears. In other words, the Davisson invention would have been absent from that imaginary machine as certainly as it was absent from the Whitehead and Nesmith and as surely as it is present in the Kitselman. Not only does the employment of divided twister disks, to which this Smith specification admittedly refers, necessarily involve the arrangement of all the supply spools back of the twister gears, but the Smith specification says so, in effect, in the following terms:

394 "I apply to the lower part of the machine feeding bobbins [the machine was evidently to be a loom with the axes of the twister gears vertical], supplied with the wires or cables which pass up to the work in suitable guides."

These terms apply to the construction shown in the Whitehead drawings and, as Mr. Wiles assumes, this is the sort of machine which Smith proposed to improve. There is no suggestion of spindles such as Davisson shows, no proposal to transfer the mesh-wire spools from below or behind the twist gears to a position above or in front of them, as Davisson and Kitselman show them, and, whatever idea of construction Smith may have had in mind, therefore, it could not correspond with that of the Kitselman patent, which is built upon the radical improvement of Davisson.

Wherefore the conclusion expressed by Mr. Wiles that the Kitselman machine would necessarily result from an embodiment of the Smith suggestion is not true. I refer to the following sentence taken from Mr. Wiles' deposition:

"Whatever may be said as to the completeness or incompleteness of the disclosure of the structure contemplated in this British patent, my own opinion is that any person familiar with the Whitehead British patent of 1854 and the Nesmith U. S. patent of 1854, might, in the exercise of mechanical skill, have carried into effect the invention thus briefly described, the *result being necessarily a construction substantially like that of the Kitselman machine*, as to the rotating twisters and the shifting mechanism."

The Nesmith patent can have no more bearing on the Kitselman patent than it has upon the Davisson patent, because the Kitselman invention proceeds from the Davisson which has been clearly distinguished from the Nesmith construction, and from the entire class of machines having twister disks with all the spools behind them, to which the Nesmith belongs.

There is, therefore, nothing in the art prior to the Kitselman

patent to which the Kitselman invention is to be referred, ex-
395 cept the Davisson patent, and I have already pointed out, especially in my direct deposition, the changes from Davisson which Kitselman has embodied in his machine and by which he has transferred the art of mesh-wire fence-making from the factory to the field.

Now taking up the last query of the question as to whether or not I find in the prior patents and exhibits anything which, in my opinion, should change the conclusions I have already expressed concerning the correspondence of defendants' machine with the subject-matter of the Kitselman claims in suit, I answer that I do not. Defendants' machine is of the same character, for the same purpose, produces the same fabric and is constituted essentially of the same elements, combined substantially in the same way, as set forth in the Kitselman patent and defined in the particular claims thereof selected for this suit. The Kitselman patent contains some claims which the defendants' machine does not conflict, such claims being those which particularly specify the form of one or another of the general elements entering into that particular embodiment of the Kitselman invention illustrated in the drawings of his patent. But the claims selected for suit are those which, in my judgment, are not restricted to such identical forms of certain devices as are shown in the patent, and not contained in defendants' machine, and are those which, under a fair interpretation, apply as well to the defendants' machine as to that shown in the Kitselman patent.

Mr. Wiles has, I believe, pointed out no differences between the defendants' machine and the illustrations of the Kitselman patent which I did not take into account in my *prima facie* deposition. The first difference between the two machines mentioned by Mr. Wiles and repeatedly urged by him is that, in the Kitselman machine, the spindle which forms a part of the central section of the three-section twister, rotates, while the spindle of defendants' machine does not rotate; that is to say, the spindle of the Kitselman machine rotates with the gear wheel which must rotate, being made rigid therewith, while in defendants' machine the spindle does not rotate, although the gear still rotates about the spindle axis. The gears rotate in all these machines, and the reason why they always
rotate is that they must give rotation or revolution to the
396 mesh-wire spools which, being part of the twisters, must also rotate in all these machines. It is not a necessity that the spindle shall rotate, but it is a necessity that the mesh-wire spools shall revolve. If Kitselman had propelled his mesh-wire spools directly from the gears, it would have made no difference whether the spindles rotated or not, and, if not, he still would have had essentially the same construction that he now has, supposing the spindles to be extended forward to the same point between the mesh-wire spools as they now are. And his claim could have fitted that modification of the present construction as well as they fit the present construction itself. This is essentially the modification which has been made in defendants machine, and I see no reason in anything urged by Mr. Wiles for changing the opinion which I first expressed

that defendants' machine, notwithstanding this modification, responds to the claims in suit of the Kitselman patent.

Nor does it effect the question of substantial correspondence, in my judgment, that defendants have invented a specifically new system of devices by which the mesh-wire spools are directly revolved by the gears, instead of indirectly through the spindles. The gears are part of the central sections of the two-part twisters, always stationary in position along with the spindles, while the side sections are shifted, and the side sections or mesh-wire spool-carriers are revolved by the central sections of defendants' machine as much, in my judgment, as they are in the Kitselman machine. Nor is it material, in my judgment, that in defendants' machine the means for shifting the side sections or spool-carriers from one central section to another are specifically different from those shown in the Kitselman patent, since no one of the claims selected for this suit specifies those means or names any means whatever for shifting the side sections. In the drafting of these claims this omission of the element of shifting devices and the limiting of the claims to the twisters themselves, while providing for the shifting capability of the side sections, recognition is clearly made of the fact that various forms of shifting devices may be employed, and the intention is clear that the claims are not to be restricted to specific devices for this purpose.

Mr. Wiles says:

397 "The spool-carriers of the Kitselman machine are so formed as to make up with the spindle extensions completely cylindrical twisters adapted to be held in the recessed guides and transferred by means of the guides. The spool-carriers of defendants' machine, on the contrary, have no such relation to the rotating centers or gears of the machine that any gear with two spool-carriers can with any propriety be called a sectional twister. In fact, the whole shape and structure of the spool-carriers of defendants' machine is widely different from the spool-carriers of the Kitselman machine."

This is only pointing out formal differences. The Kitselman claims in suit do not specify particular forms, say nothing about "cylindrical" twisters, make no reference to "recessed guides" and do not demand that the spool-carriers shall be "transferred by means of the guides." There is therefore no significance in these differences in mere form. I do not see why defendants' machine may not properly be said to have "sectional twisters." The twisters of defendants' machine are severally composed of precisely the same elements as those of the Kitselman patent. There is a spindle and a gear forming a central section, and there are mesh-wire spool-carriers forming side sections. The hollow spindle of the central section performs the same office of supporting the warp wire adjacent to the point of twisting in one machine as in the other; the spool-carriers, revolving about the axis of the spindle, twist the mesh wires about the supported warp in one case precisely as in the other, and the gear of the central section revolves the side sections or spool-carriers in one case as in the other. The two machines are

therefore essentially alike, and, as the Kitselman claims in suit are not dependent on the specific forms of the parts, defendants' machine responds to these claims as perfectly as does the Kitselman machine itself.

Mr. Wiles concludes his remarks upon the question of infringement, in part, with the following words:

"The similarity of function of the two machines is therefore wholly immaterial; and in my judgment the Kitselman
398 claims under discussion cannot be so construed as to cover defendants' machine, without at the same time including the Davisson and the Nesmith machine."

As to the Nesmith machine, it has already been shown that it belongs to a different epoch in the art and is wholly unrelated to the new era introduced by Davisson. As to the Davisson, it has been pointed out that numerous and vital changes have been made by Kitselman, improving the operation of the machine, simplifying its construction, reorganizing its elements and adapting it for a new and larger field of usefulness. There is no question in my mind that the Kitselman patent claims may clearly stand in view of Davisson and that they are wholly independent of and unaffected by anything found in the Nesmith patent. Equally I am of opinion that defendants' machine contains all the improvements upon Davisson made by Kitselman and expressed in these claims; that it is only a formally modified embodiment of the Kitselman improvement and that it answers to the several claims of the Kitselman patent in suit, when understood as they may properly be in view of Davisson and all that went before him.

Adjourned until tomorrow morning at 10 o'clock.

MARCH 7, 1899—10 o'clock a. m.

Met pursuant to adjournment; present: same as before,

MELVILLE E. DAYTON—Examination resumed.

By Mr. PARKINSON:

Q. 7. Have you examined the exhibits here in evidence, including those referred to by Mr. Wiles, with reference to the question whether they exhibit mechanisms substantially corresponding to that shown and described in the Conner patent and recited in the 2d and 3d claims thereof, and also with reference to whether they exhibit anything which would tend to limit or modify these claims within the scope attributed to them in your former testimony or which would in any way affect the opinions heretofore ex-
399 pressed by you concerning the correspondence of defendants' machine with the subject-matter of those claims. If you have done so, please state what conclusions you have reached, giving your reasons therefor?

A. I have carefully considered the single prior patent cited by defendants' expert, Mr. Wiles, to the special improvement made by Conner, and have taken into full account, I believe, all that Mr.

Wiles has said concerning the relation of said prior patent to the Conner patent in suit, and also what has been said by him, in view of such prior patent, concerning the relation of the defendants' machine to the Conner patent. The prior patent referred to is the Winsor patent. I do not find Conner's improvement in said Winsor patent and I do not agree with Mr. Wiles' conclusion that the Winsor patent robs Conner of invention and patentability, nor do I consider that the Winsor patent operates to limit the Conner claims in suit. There is nothing in Mr. Wiles' deposition which leads me to change the opinion already expressed that defendants' machine contains the subject-matter of the Conner claims sued on.

After describing the Conner construction Mr. Wiles sums up by saying:

"In other words, the mechanism thus described accomplishes the same result as the twisters and shifters of the Kitselman machine, the spindles, cross-heads, spool hub, spools, and shifters of the Davisson machine, or the rotating gears, spool-carriers and shifters of the Nesmith machine. The only change made by Conner from the prior art is therefore the substitution of a different transfer mechanism in the place of those shown in the patents of Kitselman, Davisson and Nesmith."

Except as to the Nesmith machine, which Mr. Wiles persistently and erroneously associates with the radically different machines of Davisson and Kitselman, the foregoing statement by him is the truth, but not the whole truth, and it fails, in my judgment, to accord Conner the proper merit for his really important improvement over Davisson and Kitselman. The impression given by this statement is that the shifting devices of the Conner patent are only formally or structurally different from the shifting devices of
400 Davisson and Kitselman, the conclusion being drawn by Mr. Wiles that therefore, "the claims of the Conner patent cannot be entitled to any broad construction." The fact is, however, that Conner introduced into a combination with the essential elements of the Davisson and Kitselman inventions a shifting mechanism (and necessary construction accompanying it) based on wholly different principles and operating in a wholly different way, as compared with the Kitselman mechanism of the prior art. In short, the shifting mechanism of the Conner patent is *automatic*, and is effected in the course of forward travel of the spool-carriers around the axes of the hollow spindles, leaving the orbit about one spindle for that about another without a bodily lateral movement characteristic of other and prior constructions and particularly without the separate hand operation required in the prior Kitselman machine. In other words, in the Conner improvement, which provides automatic switches for effecting the switching of the spool-carriers from one orbit to another, the spool-carrier that is being shifted passes directly from its course around one spindle to its similar course about the next one, and does this wholly by operation of the driving crank or power which impels the machine. In my judgment, there is something in this more than a mere formal change in mechanism, and the prior machines or patents do not, therefore, have the limit-

ing effect upon the Conner claims in suit which they might be said to have if the differences were merely in form and not in principle and mode of operation.

Mr. Wiles does not find in any wire fence or wire netting machine anything worth citing to this Conner patent, and his sole citation, the Winson patent, is from a wholly remote art pertaining to the formation of an article differing in kind from wire fencing or wire netting and made up of different material, to wit, a cord. In other words, the Winsor patent is for the manufacture of what is known among weavers of cloth as a harness, such harness being formed of a cord stretched between opposite members of a frame and running back and forth and knotted so as to form loops through which the warp threads for a cloth fabric pass in a loom. Two such harnesses are employed in a loom, each carrying alternate warp threads or groups of threads,
one harness rising as the other falls, so as to lift and lower
401 the two series of threads alternately to open a passage for the shuttle carrying the woof threads or filling.

The Winsor patent referred to shows an improvement in a detail of construction in machines for looping and tying the cord for such a harness. A spool, carrying one of the cords entering into the harness, is shown mounted upon a suitable supporting frame permitting the spool to revolve and give off its cord, said spool frame being provided with a rear extension which travels around the axes of intermeshing gears, giving it the proper course to effect the looping and, in conjunction with its fellow-spool, the proper knotting of the cords entering the harness. There is a striking similarity between the circular guides for the spool-carriers of this harness machine and its switching devices for changing the orbit of the spool-carrier, and the corresponding devices in the Conner patent, such, indeed, that if Conner's invention belonged to the art of making weaver's harness or if the Winsor patent belonged to the art of wire fencing or wire-netting machines, I should agree with Mr. Wiles in the opinion that there would be little of invention in the Conner patent. But these arts have no relation to each other whatever, and it is only an incident that certain details of the weaver's harness art may, by a skillful inventor, be made available in the art of wire-fencing machines. It may be legally assumed that Conner knew of the Winsor patent, and it may be assumed as a fact that he was acquainted with the Winsor machine and took his hint for his own patented improvement therefrom. But in making his improvement he did something more than merely transfer the Winsor construction from a weaver's harness machine to a wire-fencing machine. He made certain changes and introduced certain features of construction not present in the harness machine, and it was necessary for him to do this because the devices of the harness machine would not be available for the purposes of the wire-fence machine without change and adaptation. Thus it is found that, as a fact, the Conner wire-fence machine, as defined in the two claims in suit, is a very different thing from the machine of the Winsor patent.

In illustration of this proposition, I point to the fact that in the

Winsor patent each of the two spools involved (only one is
402 shown) is arranged and adapted to give off its cord in a line parallel with the plane containing the series of intermeshing gears, by which the spools are caused to travel in their circuitous courses from one end of the series to the other. Accordingly, the spools stand out bodily in front of the carriers and are supported altogether by the construction of the parts at the rear of the spools. In the wire-fencing machine each spool is one of two or three members always concerned in making a twist of the wire-fence fabric and, except at the ends of the series, two spools, along with the intermediate supporting spindle, are concerned with making the twisted joints of the wire entering into the fabric. At the margins of the fabric a single spool coacts with a hollow spindle for the support of marginal warp wire. It results that in the wire-fencing machine there is a lateral inward strain upon the spool-carrier in the direction of the central spindle, which strain must be provided against to secure the successful operation of the machine. Taking this fact and this need into account, Conner provided disks—"notched disks"—at the outer end of his hollow spindle, adapted to bear upon the outer ends of the spool-carriers so as to support the spools against the powerful inward strain upon them in the act of twisting their wires together. These "notched spool-carrier disks" are specified as elements in the Conner claims in suit, and they are entirely absent from the Winsor machine and patent. I here refer, of course, to the notched disks at the outer ends of the spool-carriers and supporting said outer ends of the spool-carriers from the outer ends of the rigidly held spindles. There are in the Conner machines inner disks also which support the inner ends of the spool-carriers so that between the two parallel disks on each spindle the axes of the spool-carrier frames are maintained in their proper parallel relation to the spindles.

In the Winsor patent there is a single set of disks, these being the disks H H which are also the gear wheels and which are more plainly shown in Fig. 4 of the Winsor patent as having the forwardly projecting portions from which laterally project the ears *h* for propelling engagement with the oval-shaped shank F of the spool-
carriers. But these disks H of the Winsor patent have no
403 supporting function whatever with respect to the spool-carriers; they are merely propellers. They obviously have nothing to do with the support of the outer free ends of the spool-carrier, as in the Conner construction. I make no point of the fact that the disks H of the Winsor patent has projections, *h*, instead of notches, for the engagement of the spool-carrier, and agree with Mr. Wiles in the general mechanical proposition that such projections may be regarded as the equivalents of notches. The essential fact which I would make plain is that Conner has not bodily taken the identical construction of the Winsor patent from one art to another, but has been called upon to make material changes in effecting an adaptation of the general Winsor idea to the different conditions and requirements of a wire-fence machine. And this, as I understand it, is enough to justify patentability in the Conner construc-

tion over that shown in the Winsor patent, and to relieve the Conner patent from the charge made by Mr. Wiles of anticipation by Winsor.

Relative to the switches proper, there is a striking structural correspondence between those of the Winsor patent and those of the Conner patent, but there is this difference, that in the Conner patent the switching projections are provided in such number and arrangement as are called for by the peculiar requisites of the wire-fencing machine, these demands being necessarily different from those in a machine for making the wholly different looped and knotted weaver's harness. I attach less significance to this change, however, than to that I have above referred to, which, in my judgment, is in itself sufficient in view of the remoteness of the art to which the two machines belong.

Of course I am guided to this conclusion by those authorities which all intelligent experts have in mind, but to which they are not usually expected to refer. I may, however, as a mechanic, say that the changes made by Conner from the structure shown by Winsor are, in my judgment, far more conspicuous than were those made by Potts & Potts from the prior machine relied upon in the case of *Potts vs. Creagor*, cited in volume 155, page 597, of U. S. Reports, while it is evident that in the Conner construction a new function is given to the newly employed disks at the outer ends of the spool-carriers or spindles, belonging peculiarly to the wire-
404 fence making machine, to wit, the supporting function as between the spindle and the outer end of the spool-carrier against the inward strain accompanying the formation of the twists.

I have not meant to be understood to say that Conner had any actual knowledge of the Winsor machine, and I have no information whatever upon that question.

It being thus still my opinion that the Conner patent is without anticipation, it is also still my opinion that defendants' machine contains the subject-matter of the Conner claims in suit. The transfer of the notched disks from the outer ends of the spindles to the outer ends of the spool-carriers I still regard as being a mere mechanical change without the slightest effect upon the supporting function as between the spindle and the spool-carrier, performed alike in the Conner and defendants' machine. Mr. Wiles has referred to the fact that in the Conner construction the walls of the notches in the disks at the opposite ends of the spindles have the function of propelling the spool-carriers in their orbits. That is true. But this is only another way of saying that the disks in the Conner construction carry the spool-carriers around. It is immaterial whether they do this by the walls of the notches or by any other form of engagement with the disks. In defendants' machine the rear or innermost disk is given this whole duty of propelling the spool-carrier in its orbit, instead of dividing the duty between the front and rear disks, while the function of supporting the spool-carrier at the proper distance from the spindle is still divided between the front and rear disks, as in the Conner patent. I do not regard the transfer of the front disk from the spindle to the spool-carrier, or the

whole or partial transfer of propelling duty from the front disk to the rear one as a material change, and I therefore am still of the opinion that defendants' machine contains the subject-matter of the Conner claims in controversy

Mr. Wiles mentions a number of formal or minor differences between defendants' machine and that of the Conner patent, to which I ought, perhaps, to refer, although I regard them as clearly of no material consequence. One of these alleged differences is that defendants' machine is wanting the external circular guides by which the revolving spool-carriers
405 are held to their orbits in the Conner patent and has the spools held to their orbits by their detachable connections with the disks at the rear ends of the spindles. In other words, spool-carriers of the Conner patent are held to their orbits from the outside of their orbits, and those of defendants' machine are held to their courses from within their orbits. This is plainly only the difference between pulling and pushing—only the difference between a wall and a string to prevent centrifugal motion.

But as a matter of fact defendants have in their latter machines, a sample of which I have seen, provided the outer wall of the Conner patent in that part of the circular course of the spool-carriers where they are free to escape the disks of adjacent twisters. But this fact need not be relied upon, I think, inasmuch as the difference referred to is only a mechanical one and cuts no figure with respect to the essentials of the two machines.

Another difference referred to by Mr. Wiles is that the spindle of defendants' machine does not rotate, while that of the Conner patent does rotate. The inner disks of defendants' machine does, undeniably, rotate, and, with the spool-carriers attached to that disk so as to be propelled thereby, this disk is really all that needs to rotate. With such non-rotation of the spindles, defendants might have used a disk freely rotating on the outer end of the spindle with precisely the same effect, and with that particular arrangement of parts it would have been obvious that there was no material difference between the two machines, growing out of the non-rotation of the spindle itself. But the application of the notched disk to the ends of the spool-carriers amounts to the same thing, and hence the non-rotation of the spindles is really immaterial to the Conner claims in suit.

It is worthy of remark that at different times Mr. Wiles considers the difference between rotating and non-rotating spool-carriers variously, as to its importance. In estimating the value of the Pope invention (hereafter to be considered), one feature of which is the introduction of stationary or non-rotary spindles, Mr. Wiles says:

"It is perfectly evident * * * that the substitution
406 * * * of spindles rotating with the gears, for the stationary tubes, or the exchange of stationary tubes for rotating tubes is a matter of mere mechanical choice and one that cannot possibly involve invention."

But in comparing defendants' machine with the Conner patent this difference is made by Mr. Wiles an important one. I am pre-

pared to admit that in some cases such a change would be merely mechanical, while in others it might constitute a part of an invention. We differ as to when it is and when it is not material. In the Conner patent for automatic switches and supporting notched disks the rotation or non-rotation of the spindle is, in my judgment, an insignificant matter, because the switches and notched disks can be made to perform their useful functions in connection with a non-rotary spindle as well as with a rotary one, only formal changes in arrangements being needed to accompany one or the other.

Mr. Wiles makes a more important stand where he says that "in defendants' machine * * * the transfer or passage of the spool-carriers from spindle to spindle is effected, solely by the peculiar construction of the rotating gears and spool-carriers themselves, and without the intervention of any switching or shipping mechanism whatever." It is "the peculiar construction of the rotating gears and spool-carriers" which, according to my view, contains the "switching or shipping mechanism," as I pointed out at length in my deposition-in-chief. It plainly is true that defendants' spool-carriers are switched or shipped from one orbit to another, and it is plain that they are so switched or shipped by "switching or shipping mechanism." It hence does not follow that because defendants' machine has not the precise form of "switching or shipping mechanism" that is shown in the Conner patent, to wit, a form which acts to push, but, on the other hand, does have a form of such mechanism which acts to pull, said defendants' machine has no "switching or shipping mechanism" whatever, or that it does not contain the essential invention of the Conner patent as expressed in the claims in suit.

Mr. Wiles also refers to the fact originally recognized by me that the switching of the spool-carriers in defendants' machine ac-
407 companies the reversal of the direction of rotation of the hand crank, while in the Conner patent such switching is shown as accompanying a continued rotation of the power wheel in the same direction. He gives no reason why this should be regarded as an essential difference, and I have discovered none since I formerly testified on this matter. The switching of defendants' machine is still automatic and the switching mechanism is combined with the notched disks and other elements specified in the Conner claims in suit, so as to respond to those claims, in my judgment, and the fact that reversal of the hand crank and consequently of the direction of motion of the several notched disks or of the several intermeshing gears, is necessary in defendants' machine, seems to me immaterial to the question as to the essential correspondence between defendants' machine and the said Conner claims.

Mr. Wiles has produced a three-spindle model of defendants' machine marked "Defendants' Exhibit Mutilated Model" supposed to have a bearing on the notched-disk feature of that machine. In this model the side walls of the notches of the innermost disk are cut away by a straight cut across the bottoms of the notches. The bottoms of the notches are left where they were so that said rear disks support the spool-carrier at the proper distance from the spindles at

their rear ends and reliance is had upon the engaging devices and surfaces by which the spool-carriers are held to these disks to prevent the lateral displacement of the latter. The front disks are not mutilated. This model is supposed to show that, as Mr. Wiles puts it:

"The side walls of these notches have nothing whatever to do with pushing the spool-carriers around in their circular paths or with the rotation or transfer of the spool-carriers. These functions are effected by the spring pin on the front plate of each gear and the cast lug on the gear itself, through their engagement with the grooves in the base plate."

It seems, then, that other depressions ("grooves") and other projections provided in defendants' machine do the same thing as the notched walls when the disks are unmutilated, or as would
408 be done by the notched walls, unmutilated, if these added grooves and projections were not present. The significant fact in this statement of Mr. Wiles is the admission that in defendants' machine *the same thing is done that is done in the Conner patent*, and that only another form of grooves, notches, projections or engaging surfaces do that thing. After insisting that the projections, *h*, on the Winsor disks engaging recesses in the Winsor spool-carriers are essentially the same things as the recesses or notches in the Conner disks which receive projections on the spool-carriers it seems to me Mr. Wiles should not deny that these grooves and pins of defendants' machine, admitted to do the same thing as the walls and the notches which he has removed in the mutilated model, are, in effect, the same thing as the walls of the notches which in said model he has cut away.

But, whatever may be true of this mutilated model, defendants' machine itself shows a careful purpose to fit the notches of the rear notched disks to the shanks of the spool-carriers and to rely upon the walls of said notches, in connection with the fastening devices, to propel the spool-carriers in their orbits, and I doubt if the mutilated construction of the model referred to would be found entirely satisfactory in an actual working machine.

I do not regard this point sought to be made by Mr. Wiles as of any significance whatever, and I do not consider the mutilated model as showing an essential departure from the Conner inventions specified in the claims in suit, for the reason that, at best, said model merely shows the substitution of one form of device for another admittedly for accomplishing the same thing.

There is nothing in these various formal differences between the defendants' machine and the illustrated embodiment of the Conner invention given in that patent which, in my opinion, relieves said defendants' machine from the Conner claims in suit.

Q. 8. Have you examined the exhibits in evidence with particular reference to the question whether any of them exhibit mechanism substantially similar to that shown and described in the Pope patent and recited in the first, ninth and tenth claims thereof, and
409 whether they exhibit anything tending to limit or modify these claims to any extent which would affect the opinions

heretofore expressed by you concerning the correspondence of defendants' machine with the subject-matter of these claims? If you have done so, please state with what results, giving your reasons for such opinions as you may express.

Adjourned until tomorrow morning at 10 o'clock.

MARCH 8, 1899—10 o'clock a. m.

Met pursuant to adjournment; present: same as before.

MELVILLE E. DAYTON—Examination continued:

A. I have examined the exhibits referred to in the question with reference to the question whether or not they present the mechanisms described in the Pope patent and recited in the first, ninth and tenth claims thereof, and whether they contain anything calculated to affect the opinions heretofore expressed by me concerning the essential correspondence of defendants' machine with the subject-matter of these claims, with the result that I find nothing in said exhibits answering to said claims or calling for any change in the opinions which I have heretofore expressed as to the correspondence of defendants' machine with said claims.

Like the Kitselman and the Conner inventions, the invention of the Pope patent is in the nature of an improvement upon the Davisson machine, but having also for a part of its basis the Kitselman portable structure. The subject-matter of the Pope improvement will be recalled by the requotation at this point of the ninth claim, which states the improvement in general terms.

"9. In a wire-fabric machine, the upright frame having openings, stationary warp-wire tubes secured to said frame and aligning with the openings therewith, a series of aligned twister wheels loosely journaled on said stationary tubes, and shiftable spool-carriers mounted to slide on said wheels, substantially as set forth."

410 The other two claims in suit, to wit, the first and the tenth, are more specific than the above in the mention of structural features.

In Mr. Wiles' lengthy description of the Pope machine he elaborates upon features of construction and particularly upon the specific means shown in the Pope patent for shifting the spool-carriers, which devices are not mentioned at all in claims nine and ten and are referred to in only the most general terms in claim one. The "shifting devices" actually shown in the Pope patent do, in fact, correspond in form essentially with those shown and described in the Kitselman patent; but obviously claim one which makes them an element only under the general term "shifting devices for sliding the spool-carriers from one wheel to the other," and claims nine and ten which make no mention whatever of any form of shifting devices, are not restricted, or intended to be restricted, to this particular Kitselman form of such devices. Yet Mr. Wiles bases upon this resemblance of Pope's to Kitselman's shifting mechanism, the following statement and conclusions:

"The fundamental principle of this machine, not only in its gen-

eral terms, but in the relation of the parts of its transferring mechanism, is therefore evidently the same as that of the Kitselman machine."

There is no fault to be found with the recognition of general correspondence between the Kitselman and the Pope machine. I admit them to be much alike in many particulars, as, indeed, they must be, since they are both founded upon the common basis of the Davisson invention. Pope uses features previously invented by Kitselman, but he couples them with independent improvements of his own which have at least such merit as to have been thought worthy of adoption by defendant in its machine. The two new things which Pope did were, first, to make the hollow spindles of the prior machines non-rotary, utilizing them as axles upon which to rotate the twister gears, and, second, to detachably support the mesh-wire spools from the twister gears, which he did by providing a sliding
411 and holding connection between the rear ends of the spool frames and said gears. Pope has made both these features conditions of each of the three claims in suit, most broadly and generically in claim nine and less so in claims one and ten.

Mr. Wiles does not cite any patent or any instance in the prior art showing a combination of those two elements or features, or any combination embracing them as elements. He is for the most part content to belittle the improvements and to deny invention therein.

Immediately following the above quotation from Mr. Wiles' deposition concerning the Pope construction, he asks:

"What has Pope done, in producing his machine, taking the Kitselman machine as a starting point?"

And he answers himself in substance as follows:

"[He has, in substance, cut off the front end of each of the segmental spool-carriers of Kitselman, leaving the other segmental end to serve as the base; and he has provided the remaining segmental end or base of each spool-carrier with a dovetailed tongue adapted to engage a corresponding groove on the front face of the rotating gear." * * *

"What Pope has done then is to make a simplified Kitselman machine, embodying, as its fundamental departure, the change from the Kitselman spool-carriers with two segmental ends to the spool-carriers having segmental heads at one end only; and as a means of preventing longitudinal movement of the spool-carriers directly away from the gears, at the same time leaving them free to slide from gear to gear, he has formed the bases with dovetailed tongues engaging corresponding grooves on the gears."

Mr. Wiles omits to mention here the feature of the Pope improvement which consists in making the spindles non-rotary and utilizing them as axles for the rotary gears, but he says enough in the above-quoted passages about the other feature of Pope's improvement to make his immediately following denial of invention therein
412 a contradiction of an obvious fact. Simplification of complicated mechanisms, and especially the simplification of machines designed for the use of farmers and similarly unskilled persons, is, I believe, a recognized object of invention, and when

involving extended changes that are not obvious to a mechanic and which cheapen as well as simplify the machines and render its care and operation easier in the unskilled hands for which it is intended, this object is one of the highest that can be had in view in the improvement of such machines.

The patents specifically cited by Mr. Wiles to the Pope invention are the Winsor patent, the Morgan patent, the Middaugh & Wilcox patent, the Kitselman patent, and the Reppeto patent, together with the Defendants' Exhibit Cochrane Machine, said to embody, or exemplify, in substance, the improvements set forth in the said Morgan patent.

I do not understand Mr. Wiles to express the opinion that either or all of these patents anticipate either of the claims of the Pope patent, but that they somehow operate to emasculate the Pope patent of all invention. In answer to cross-question 27, where he was asked which of the patents or exhibits prior to the Pope patent he regarded "as most nearly embodying the invention recited in the first, ninth and tenth claims of that patent," Mr. Wiles replied:

"A. On the whole, the Kitselman discloses the nearest prior embodiment of the combination of elements found in the Pope machine or recited in claims one, nine and ten of the Pope patent. The Morgan patent presents many features of construction analogous to the corresponding elements in the Pope machine; and the wire-and-slat machine patents of Middaugh & Wilcox and Reppeto show the interchangeability of stationary and rotatable spindles."

It seems to me that as to the Kitselman patent, which Mr. Wiles here gives first place as an anticipation of the Pope claims, he has answered himself in the quotations I have above made from his deposition as to what Pope had done, proceeding from the
413 Kitselman machine as the starting point. As to the other patents mentioned in this answer, they are not asserted to be anticipations of any of the claims.

It will be observed that Mr. Wiles here makes no reference to the Winsor patent (for machine for making weavers' harness), and which he had previously mentioned in his direct testimony as showing a spool-carrier supported at its base only.

The Morgan patent, though not claimed in this cross-answer of Mr. Wiles to be an anticipation of any claim of the Pope patent in suit, deserves a word in view of the earlier reference by Mr. Wiles to this patent, where he says that it affords "another example of slidable spool-carriers supported at their bases only and engaging the slotted gears." The Morgan patent, in fact, shows nothing of this sort, as will be obvious from an examination of Fig. 3 of the Morgan patent drawing. Besides, in the Morgan patent the hollow spindles rotate with the gears and directly give rotation to the spool-carriers which are at the front ends of the spindles and widely remote from the gears, which are situated at the rear ends of the spindles, with two frame uprights between them and the spool-carriers. The Cochrane machine, which differs widely from the construction shown in the Morgan patent, does have spool-carriers

which are supported and revolved from their rear ends, said rear ends of the spool-carriers being slidingly engaged with radial grooves in disks which are rigidly secured to rotating spindles at a considerable distance from the gears themselves and which gears give rotation to the spindles by being made fast thereon.

There is thus to be found in the prior art not a single instance of an anticipation of any Pope claim in suit.

Not much significance is given by Mr. Wiles, even, to the Middaugh & Wilcox patent and the Reppeto patent, but in my judgment they do not possess the little significance he gives them. Neither of these two patents shows spool-carriers of any kind, and what Mr. Wiles evidently calls a spindle is strictly not a spindle at all and much less is it anything corresponding with or answering to the spindle of the Pope twister. The twisting gear wheel of the Middaugh & Wilcox patent, with its perforated twisting plate, rotates upon a mere stud through which the two stringer wires of the
414 wire-and-picket fence of course pass, said stud being, like the axle of a wagon, non-rotative. The gear wheel of the Reppeto patent has, on the other hand, a projecting journal on each side, forming a hub which rotates in a bearing, the gear wheel having a hole through its center and through the double hub to give passage to the two stringer wires of the similar fencing.

There being nothing in the prior art to anticipate or, in my judgment, to restrict the claims of the Pope patent in suit, I see no reason for changing the opinion I previously expressed to the effect that defendants' machine contains the subject-matter of said Pope claims. Defendants' machine has undeniably non-rotary spindles serving as axles for the rotary gears and has the shiftable spool-carriers mounted to slide on said gear wheels so as to be slidingly transferred from one gear wheel to the next. It also has shifting devices to effect such movements of the spool-carriers. Defendants' machine moreover, has an upright frame provided with openings which align with the openings or passages through the non-rotary spindles. In other words, defendants' machine undeniably has all the general features of the Pope machine and of the Pope claim nine. It also has the essentials of the more specifically defined features of claims one and ten.

All that Mr. Wiles has pointed out concerning the actual construction of defendants' machine is precisely what I recognized in my former deposition where my above opinion was first expressed, and he states nothing which seems to me of any consequence as affecting that opinion. He says:

"The defendants' machine does not have gears having parallel face grooves, shifting spool-carriers having tongues registering with the grooves in the wheels, or shifting devices for sliding the spools therein from one wheel to the other, this being the description of these parts in claim one. The defendants' machine does not have shiftable spool-carriers mounted to slide on the rotating wheel, and therefore does not conform to the Kitselman claim nine, and the defendants' machine has no shiftable spool-carriers having a sliding

tongue or groove connection with the twister wheels, this
415 being the description of the relation of the parts found in claim ten. The spool-carriers in the defendants' machine do not transfer by sliding from one wheel to the one next it."

This seems to me to be a quibbling sort of statement, and it is not, in my judgment, improved by the elaboration which follows of the minute details of difference in the forms of the engaging parts, in the precise time and kind of movement of parts, etc., all of which I fully took into account in my deposition-in-chief. Mr. Wiles makes no reference here to the fact that along with such shifting movements, shifting devices and engaging devices as defendants' machine has, it also has non-rotating spindles with the gear wheels rotating thereupon, which, however, he does not deny.

For my part, I do not think of any term which so well expresses the movement by which the laterally projecting tongue or base of defendants' spool-carrier enters the recess or groove in the forward projection or face of the gear wheel, as the term "sliding," and I do not know of any better term for defining the devices by which a spool-carrier is transferred from one gear face to another than the term "shifting devices." It is also true that while the base of defendants' spool-carrier slides into an adjacent gear face in each rotation and whether the shifting is then to be effected or not, said piece is slid from each gear face so that it may proceed with the other; only by means of the "shifting device." I have pointed out in my former deposition the essential correspondence between an ordinary tongue and groove and the projection and recess of defendants' machine, and, since Mr. Wiles does not and cannot produce a single instance of a construction corresponding, however broadly, to that of the Pope claims, I see no reason why the more specific claims one and ten are not entitled to fairly liberal interpretation at the hands of the court so that they may embrace the essentially similar construction of defendants' machine, besides, of course, holding said machine under the indisputably adequate terms of claim nine.

Q. 9. You speak in answer 7 of the orbit in which the
416 spool-carriers of the Conner patent travel when passing to a higher or lower plane or into relation with an upper or lower spindle. What, if any, advantage has this orbital movement as compared with the method of transfer illustrated in the Davisson patent, and how does the defendants' machine compare in this respect with that of the Conner patent?

A. It will be recalled that in the Davisson patent the transfer of the mesh-wire spool-carriers is made from one spindle to another when the spool is directly between and in line with the adjacent spindles, and also that such transfer is made by a bodily movement away from one of the spindles and toward the other. It follows that the spool-carrier must be smaller than the distance between the spindles. In the Conner construction, on the other hand, the orbital circles around the two adjacent spindles coincide or touch at the point directly between the spindles and the transfer of the spool from one spindle to another or from one orbit to the next involves no bodily lateral movement of the spool-carrier away from one spin-

dle and towards the other in a line between them, and it consequently follows that the spool, with its carrier, may be made of a size practically filling the space between the two spindles.

The advantage of this construction in a wire-fencing or wire-netting machine is obviously that the mesh-wire spool, being made larger than was possible in the Davisson construction, holds more mesh wire and requires, therefore, to be less frequently removed, refilled and replaced.

Defendants' machine corresponds with the Davisson and the Conner patents in making the transfer of the spool from one twister to the next when the spool is in line between the two adjacent spindles, and it corresponds with the Conner construction and differs from the Davisson in that it contains the Conner improvement upon Davisson whereby the bodily movement of the spool away from one spindle and toward the other in a straight line between them is obviated, or, in other words, in making the orbits of the axes of the spool-carriers coincident with the pitch lines of the gears or to touch at a point in the straight line of the two adjacent spindles and employing switches, sending them directly from one orbit to the other. Defendants' machine, has, therefore, the advantage afforded by Conner's im-
417 provement of allowing the larger spools for the mesh wires to be employed by which time and labor are saved in recharging them.

Q. 10. Have you examined "Complainants' Exhibit Certified Model"? If so, how does it compare with the mechanism shown in the drawing of the Nesmith patent and described in the specification thereof?

A. I have examined the model referred to and compared it with the drawing and description of the Nesmith patent, and I find the model to agree with the patent.

Q. 11. What, if any experience have you had to familiarize yourself with the proceedings in the Patent Office and the conditions under which and purposes for which and methods by which amendments are made in pending applications?

A. I have had an experience as a solicitor of patents before the United States Patent Office covering nearly 28 years, and during that time I have prosecuted probably more than two thousand applications for patents before that office.

Q. 12. Mr. Wiles appears to represent that where applications are amended after rejection of certain claims, either by substituting other claims or by insertions in the existing claims, this is an admission that the claims as they stood before such amendments or substitutions were invalid, or that whatever was embraced in such claims is thereby admitted to be old. Does your observation and experience indicate such to be the fact; and in answering this question, will you please explain some of the methods and purposes of making amendments by substituting or rewriting the claims or otherwise changing their phraseology, and some of the circumstances under which such changes are made?

By Mr. BANNING: Defendants' counsel objects to the question as

calling for the opinion of the witness as to the legal effect of proceedings in the Patent Office when such legal effect is to be determined by the courts and by the decisions of the courts in relation to such matters. The opinion of the witness is, therefore, immaterial and incompetent.

418 A. My understanding does not accord with that expressed by Mr. Wiles, and, from my observation and experience in dealing with examiners in the Patent Office in connection with the amendment of claims, I believe that the examiners and the Patent Office authorities also do not share Mr. Wiles' understanding. That is to say, the amendment of a claim by changing its phraseology or by the insertion of additional elements is not conclusive that the claim as originally expressed was not a valid one or was not for novel elements or for a novel combination, and I do not understand that the erasure of a claim, when accompanied by a modified substitute, necessarily carries with it the admission that the erased claim was for old matter or the admission that the real invention finally secured lies exclusively in the difference between the erased claim and the amended one.

If the rule were as Mr. Wiles understands it to be, there would be very few patent claims in existence of any considerable worth. Take, for example, the frequent case where a solicitor sees fit to erase one or all of the claims he has submitted to the office and to substitute other claims therefor, broader, it may be, or only changed in phraseology, before any action at all has been had on the case by the office. It is absurd to say that the erased claims constitute a confession and definition of what the applicant admits to have been old. Again, it frequently occurs in the experience of a careful solicitor that, when considering an action of the office which may have been adverse, but which was believed to be wholly or partly erroneous, the solicitor will choose to make a modification in a claim, rewriting and erasing the original, by which he hopes to make the novelty of the real subject-matter more clear to the examiner or the claim more satisfactory to himself. Again, it is customary for some examiners to find what they regard as substantial duplication in the different claims presented, or some of them, and to require the erasure of one. This, of course, does not carry the implication that the claims which the applicant or his attorney may select for erasure is for old matter and that the claim left standing is for only such matter as may lie in the difference of statement. Speaking with reference to those erasures and amendments which are made in view of rejections, it is quite common to resort to restatement for

419 the purpose of presenting the same or substantially the same matter to the examiner in different form, the original statement being erased and replaced by a new one, and it is not infrequent that such representation of the same matter begets its recognition and allowance at the hands of the examiner with no thought on his part or on the part of the patentee or the attorney that such restatement constitutes an admission that the former statement was for old matter, anticipated by the reference originally cited by the examiner.

Reasons more numerous than can be here mentioned, if they could be recalled, are constantly leading to the amendments of pending claims with no thought on the part of the applicant or his attorney of necessarily surrendering matter of claims erased and with no thought on the part of the Patent Office of such matter being surrendered by the act of erasure. A few years ago it was a positive requirement of the Patent Office, or possibly of some of its examiners, that when any claim was to be amended, all the claims previously made should be erased and a new series written out consecutively and substituted. In such rewriting of erased claims there would frequently be modifications made due solely to the choice of the writer on further reflection, or on further criticism. Of course, erasure of such claims and their repetition did not weaken the claims allowed, and now that that rule has been abrogated in the Patent Office, many attorneys, from choice, pursue the practice which it called for.

I have always understood that a man may, by the erasure of a claim without a substitute, and in the absence of its practical equivalent, surrender to the public a material part of his invention, as he may fail to secure it by neglecting to make appropriate claims therefor, in the first place, but I have never understood that the restatement of substantially the same subject-matter in a claim to replace one that had been erased, is invalid for that reason, or that the erased statement of the same matter may be brought up against the patent to show admission of lack of novelty therein. The circumstances of each case are, I think, to be taken into account in determining the intent or the effect of erasing claims in course of prosecution in the office.

Q. 13. What have you found to be the practice there in respect to making oral arguments before the examiners? Has, or has
420 not, that been customary throughout your experience, and do, or do not, any minutes of such oral arguments appear in the records?

A. Oral arguments and personal interviews between the attorney and examiner have been customary throughout my acquaintance with the Patent Office, and often changes in claims have, in my experience, been arrived at and inserted on the spot without being accompanied by any written reason therefor or anything expressive of what may have passed between the examiner and myself. I think this has been the experience of most attorneys practicing before the Patent Office, and especially of those residing in Washington. To make my answer complete, I should add that no memoranda or minutes would appear in the record on file to show that such interview had taken place or argument had been made.

Cross-examination by Mr. BANNING:

X Q. 14. Do you know anything about the history of the Nesmith patent or invention or anything about the inventor, John Nesmith?

A. Nothing from personal knowledge about John Nesmith, but I have seen the recorded history of the patent in the Patent Office.

X Q. 15. Was not John Nesmith the first man who ever invented a machine for making a woven-wire diamond-mesh fence fabric?

A. The Nesmith patent and the Whitehead British provisional specification are both dated in 1854, the Nesmith patent being issued two or three months prior to the filing of the British specification. That makes Nesmith the first in the art, so far as this record shows. I will add that I know of nothing outside the record earlier than Nesmith.

X Q. 16. Is it not a fact that after John Nesmith got his patent he established a factory in Massachusetts, and for many years manufactured the woven-wire fabric shown in his 1854 patent, or do you have any knowledge, personal or acquired, on the subject?

A. I think it probable from what I have been told that he had some sort of a machine by which he manufactured those light
421 fabrics formerly known to me and having the form illustrated in his patent drawing used chiefly for confining chickens and other fowls.

X Q. 17. As both yourself and Mr. See have had a great deal to say in reference to the Nesmith 1854 patent, in which you have questioned its practical and operative character, I desire to ask you if we do not find in the American Annual Cyclopædia and Register of Important Events of the year 1869, published by D. Appleton & Co., in 1872, the following account of John Nesmith and reference to his invention in woven-wire fence fabrics, namely:

"Nesmith, John, one of the most enterprising and successful of New England manufacturers, born at Londonderry, N. H., August 3, 1793; died October 15, 1869. Mr. Nesmith commenced life a poor boy, and had only the common advantages of education at that time. At fourteen years of age he was placed in a country store, and served an apprenticeship of five years, after which, in connection with his brother Thomas, he went into business for himself. As soon as their cash capital and enlarged credit would warrant the adventure, the brothers removed to New York and built up an extensive and highly remunerative trade. In 1831, foreseeing the future importance of Lowell, Mass., as a manufacturing center, they settled in that place, invested largely in real estate, and identified themselves with every measure calculated to advance the growth and prosperity of the home of their adoption. Mr. Nesmith's peculiar tastes and talents soon enlisted him in the manufacture of blankets, flannels, printing cloths, sheeting, and other textile fabrics, and from thenceforth that was his principal pursuit. He became agent for, or as owner was interested in, mills at Lowell, Dracut, Chelmsford, Hookset, and other places, and managed all those enterprises with almost unvarying success. In the celebrated Merrimack Woolen Mills Company he was a large stockholder. Appreciating more than any other man, the natural advantages of the water power which has made Lowell what she is, he bethought
422 himself of securing the supply of water in Winnipiseogee and Squam lakes, in New Hampshire, as reservoirs for the Lowell mills in dry seasons, and letting it into the Merrimack by artificial channels. This brilliant conception was at first scouted as

impracticable by manufacturers along the river; but Mr. Nesmith, satisfied that they would at last require the additional water, bought the right to use both those lakes for the purpose named, and the manufacturers were before long obliged to purchase it from him. Mr. Nesmith was the first to discern the natural fitness of the site now occupied by the flourishing city of Lawrence, on the Merrimack, for a manufacturing point, and made heavy purchases of lands there on both sides of the river, securing also the necessary charter to control the water power. About 1844 his bold scheme attracted the attention that it deserved from Boston capitalists, and factories began to rise at Lawrence as if by magic, and that city has since most amply vindicated the wisdom of its real founder. While Mr. Nesmith was carrying on these multifarious and arduous undertakings, he devoted off hours to philosophical and mechanical studies, in which he became much more than an amateur. Several of his discoveries and inventions were of great importance and value—among others the well-known machinery for making wire fence and shawl fringe. Though naturally averse to mingling in politics, and never stooping to the arts by which popularity is often won, he was elected to various offices in the city government at Lowell, where his sound, practical sense and extraordinary business capacity were acknowledged and prized by his fellow-citizens without distinction of party. He was presidential elector in the college which chose Mr. Lincoln for both terms, was lieutenant-governor of Massachusetts in 1862, declined a re-election in 1863, and was afterward appointed United States collector of internal revenue for his district, which office he filled ably and acceptably until his resignation, twenty days before his death. His attachment to the principles of his party
423 was that of the moralist rather than the partisan, and he never ceased to command the respect of his political opponents. The temperance clause in Massachusetts early engaged his hearty support and liberal contributions, and he was for some time a vice-president of the State alliance. From the large fortune acquired by his tact and industry, he made generous donations to many objects of charity and benevolence which won upon his sympathy, and he was invariably hospitable and kind to his friends and neighbors. In his domestic relations he was especially tender and affectionate. His will made handsome provision for the foundation of a 'Nesmith fund' for the aid, support, education, and maintenance of the indigent blind of New Hampshire, and also a public park in the town of Franklin in that State. The secrets of Mr. Nesmith's career may easily be found not more in his high mental endowments than in his unflagging industry, his indomitable perseverance, his strict integrity, and the concentration of all his faculties and energies upon the successive objects in hand, and those temperate and well-ordered habits of life, which, down to its close, preserved his mind in all its youthful strength and buoyancy. He offered a rare illustration of what an active intellect may accomplish, aided by courage and fixity of purpose, and animated by principles of truth, justice, and honor."

Complainant objects to the foregoing question as in every respect incompetent and irrelevant, and particularly objects to the injection into the record of the biographical sketch purporting to be quoted therein, as incompetent and irrelevant, as not proper cross-examination, and as improperly burdening the record with extraneous matter.

A. I do find in the publication referred to the biography of John Nesmith above quoted in the question, the reference therein "to his invention in woven-wire fabrics" consisting exclusively of part of the following single sentence:

"Several of his discoveries and inventions were of great
424 importance and value—among others the well-known machinery for making wire fence and shawl fringe."

If the question, by the use of the words "reference to his invention in woven-wire fabrics," is intended to be applied to the fabric of the patent to a John Nesmith, present in this record, or otherwise to the machine or product set forth in said patent, I add that I have no means of identifying the machine or product of the patent exhibit with the general mention of "machinery for making wire fence" which I have just quoted from said biography, as, indeed, I have no means of identifying the biography itself with the Nesmith of the patent exhibit.

The opening clause of the present cross-question, if I understand it to refer to what I or Mr. See has said concerning the Nesmith *machine*, contains an error of statement, I have questioned the adequacy—the fullness, completeness and sufficiency—of the Nesmith patent specification and drawings, as a disclosure of the Nesmith machine, whatever that may have been with respect to the construction of some of its parts; but I have not, and believe Mr. See has not, disputed the operativeness of the Nesmith machine intended to be described in said patent. On this point I have no knowledge whatever, and no information.

X Q. 18. As I understand you, the patents in suit in this case are to be construed as if the Davisson patent represented the commencement of the art. Is this correct? Do you wish to assume or occupy this position?

A. I have not stated anything to that effect and have not neglected to examine the art prior to Davisson for matter bearing upon the Davisson patent and the other patents in suit. As a result of this examination and of a comparison of each of the patents sued on with the art prior to it, I have found that Davisson made radical and revolutionary departures from prior constructions and that the patentees of the subsequent patents in suit employed the Davisson invention and improved thereupon. It thus turns out, as a matter of fact, that nothing prior to Davisson has any material bearing upon
425 the Davisson invention itself or upon the inventions of the three other patents in suit, as said inventions are defined in the claims in suit of these several patents.

I have no hesitation in saying, in view of the facts pointed out, that Davisson introduced a new era in the art, to which era the other

patents in suit and defendants' machine belong, and that for the purposes of this investigation the prior art of the Nesmith era (so to call it) is self-excluded.

X Q. 18. Each of the patents in suit and the defendants' machine weaves, severally, a diamond-mesh woven-wire fence fabric, as has been repeatedly said. Please state where we are to look to find the commencement of the art of weaving a diamond-mesh fence fabric by machinery?

A. The statement with which this question opens is not a full or accurate statement of the fact. The full fact is that each of said machines weaves, or is capable of weaving, a diamond-mesh wire fence fabric *with longitudinal tension wires passing through the middle of the diamonds and through the twists of the mesh wires at the angles of the diamonds and where said diamonds intersect and are joined.* This fabric, or a machine capable of making it, was not known in the art of wire-fence making prior to the Davisson patent.

Diamond-mesh wire fence fabric without such tension wires so combined with the diamond meshes, was known prior to the Davisson patent, and machines for making it were also known, and it is true that the machines of the Davisson and other patents in suit and defendants' machine are also capable of making such fencing. Considered with reference to this last-mentioned product—the only product referred to in the question—there is a common art reaching back to the first instance of a machine for making such plain fabric. Of this common or more general art the Nesmith patent is the first instance of record, and, so far as I am aware, is the first instance to be found, although the statement of the Nesmith patent announcing "the principle and main features of novelty" in the invention there set forth appears to imply the existence of still earlier constructions.

X Q. 19. You say in your last answer that the Davisson, Kitselman, Conner and Pope machines of the patents sued on and the defendants' machine are all capable of weaving a diamond-mesh
426 wire fence fabric without the longitudinal or tension wires running through the meshes, as I understand you. When used to weave such fence fabric where, in your opinion, is the commencement of the art?

A. Without reference to whether the machines referred to in the question are ever used, or not, for making that fabric, the art pertaining to that fabric of course begins with the first machine for making it, which, so far as this record goes, is the Nesmith machine.

X Q. 20. You have laid great stress upon the capacity found in the Davisson, Kitselman, Conner and Pope patented machines and in the defendants' machine of weaving a diamond-mesh woven-wire fence fabric containing longitudinal or tension wires running through the meshes. When such machines are used to weave the same kind of diamond-mesh wire fence fabric, but without longitudinal wires running through the meshes, do you consider that they would be infringing or trespassing upon the claims of the patents sued on which have been relied on as infringed in this suit?

A. Certainly, so long as they contain the combinations expressed in the claims in suit.

X Q. 21. Then, if the machines of the patents sued on were used by an unlicensed person to weave the Nesmith fabric, as shown in his patent, you think they would be infringing the claims relied on as infringed in this suit. Is this correct?

A. It is.

X Q. 22. If the gears J, E and X of the Nesmith machine were all perforated as are the outside ones, would not the Nesmith machine be capable of weaving a diamond-mesh wire fence fabric with longitudinal or tension wires through the meshes—in other words, be capable of making the fence fabric of the Davisson and other patents sued on when they contained the longitudinal tension wires through the meshes?

A. It would, with the addition of the necessary further tension-wire spools for the supply of such added intermediate tension wires and with the provision of something not shown or described in the patent, for holding the deflected mesh wires in the notches of the outer twisters, and, generally, assuming the subordinate mechanisms to be adequate for their several purposes.

X Q. 23. The sixth claim of the Nesmith patent mentions
427 the feeding and twisting gears. Those are the gears J, E and X that we have been talking about, are they not?

A. More accurately stated, the feeding gears are the gears E and X in the rear half of the machine, and the twisting gears are the radially slotted gears J, separate from the feeding gears and in the front part or general division of the machine.

X Q. 24. The sixth claim speaks of the gears "with or without their centers perforated." Would this claim mean anything different if it simply said "with their centers perforated"?

A. Let us first see what the actual words of the claim do mean. The full statement of the claim on this point is: "With or without their centers perforated to admit the border or warp wires passing through the same * * * substantially as hereinbefore set forth and specified." It is thereinbefore "set forth and specified" as follows:

"The border wire to netting and top and bottom wire in fence is usually larger than the wire to be twisted, although the wires can all be of the same size, if desired. The wire [for the border] is placed upon the reels C C, Fig. 1, [shown to be two in number and fixed in position], and then one end of the same is passed through a hole which is drilled in the center of the *four outside gears, E E and X X*, Fig 1. The said wires are then passed to the twisting parts of the machine, and through holes drilled in the centers of the *two outside twisting gears, J J*, Fig. 1." (See page 1, column 2.)

After directing the insertion of the intermediate mesh wires and describing mechanisms and their operation, the patent says, page 2, near the top of column 2:

"That is, one set of shippers moves the four inside wires one way and the other set of shippers will move the four inside wires the other way at the required time to harmonize with the other correct

movements of the machine. The *two outside or border wires*
428 never move transversely, but move longitudinally, like the other wires, except that they pass through a hole drilled in the center of the *four outside feeding gears* and the *two outside twisting gears.*"

The italics are mine.

The above being what is "hereinbefore set forth and specified" concerning holes through the feeding gears and twisting gears, it is evident that Nesmith never contemplated the provision of such holes except "in the center of the four outside feeding gears and the two outside twisting gears," and that he meant by what he actually says in the claim "with or without" "holes drilled in the center of the four outside feeding gears and the two outside twisting gears."

Having determined what the claim means as it actually reads, what it would mean with the words "or without" erased, is easily determined. In other words, Nesmith would then mean *with* "holes drilled in the center of the four outside feeding gears and the two outside twisting gears."

X Q. 25. If the four outside feeding gears and the two outside twisting gears were made "without" holes through them—and if the language of the claim has reference simply to these outside feeding and twisting gears, they can be made, according to the language of the claim, either with or without the holes—the fabric woven on the machine would have no outside or marginal longitudinal wires whatever, would it? And what kind of a fabric would the machine produce in that case?

A. The fabric produced in that case would have outside or marginal wires and the fabric, with its meshes, would be only a little elongated by the tension of the drawing-out and take-up mechanisms in drawing the marginal wires straight to compensate for the slight deflection thereof due to their leaving the twister gears at the bottoms of the slots instead of at the exact center. In short, the fabric would be precisely what Nesmith contemplated the machine would make "without" the center holes in the feeder gears and the twister gears. It was because the machine would make the fabric without special border wires that he avoided the limitation of his claim to the use of center holes, these center holes in the outside gears
429 being more especially provided because "the border wire to netting and top and bottom wire in fence is usually larger than than the wire to be twisted, although the wires can all be of the same size, if desired."

X Q. 26. The fabric that would be made when the outside feeder and twister gears were made without center holes would simply have for its margin the woof wires, which would be carried out and in in the operation of weaving so that the margin would not be a straight one, but would be notched or serrated, would it not?

A. No. The deflection given to the outside wires would not result in leaving the fabric with a notched edge, but the pull on the take-up roller or produced by the jaws which seizes the fabric and draws it forward, would draw the marginal wires practically straight, and in doing so would only slightly elongate the diamonds. It must be

borne in mind that the marginal wires in that case are only temporarily deflected and are not fastened in their deflected position by attachment to an outer wire. When the twist is made between the marginal wire and an adjacent inner one the latter is moved out part way to be twisted with or wrapped around the marginal wire and then, when the inner wire is moved inward to twist with the one beyond it, the outer wire is not correspondingly moved outward to twist with any one beyond it, and therefore it is free to draw straight, or practically so, as the fabric is pulled forward by the jaws or take-up roller, one or both.

X Q. 27. If you deprive the outside feeder and twister gears of their center holes, what is used to form the margins of the fabric? Are not the wires on the spools C which form the marginal wires in the machine shown in figure 1 dispensed with when you dispense with the center holes in the gears through which they pass?

A. I think the spools C C, two in number, placed at the rear of the rearmost outside feeder gears, are intended especially to supply special marginal wires to be passed through the center holes in the outside feeder gears, indicated to be present in the drawings of the patent by the wires shown as passing through the centers of these gears and actually shown in the certified remnant of the Patent Office model. If such center holes in the gears were to be disused these spools might also be disused, and if the center holes in the gears were not present at all the particular border-wire spools C C might be removed. On the other hand, if desired, such spools might be employed to supply wires passing through the gear slots which are directed outwardly when the gears are at rest, which wires might be of the same size as the woof or inner wires of the fabric. Or such outermost wires could, I think, be supplied from "stands," carrying spools, attached to the outermost feeder gears at that side of their axes which would be outside when the gears are at rest, the wires from said spools passing through the adjacent slots of the forward feeder gears and the adjacent slots of the twister gears. It is to be understood that, according to the patent, these feeder gears make an even number of revolutions in making a twist, as, for example, two revolutions. Wires from spool stands applied as I have suggested, or trained from the spools C C, as I have suggested, would not be shifted at all, but would continue to pass through and to remain in the same notches, the inner wires only being shifted.

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X Q. 28. If you dispense with the center holes in the outside feeder and twister gears and, at the same time, with the marginal wire that passes through them, what do you have to form the margin of the fabric in the Nesmith machine?

A. A wire.

X Q. 29. Supplied from where?

A. It may be supplied from the spool stand which I have suggested in my last answer as being attached to the side of the twister gears, which, when at rest, is outermost, and therefore exempt from the action of the shifting devices by which the corresponding spool stands for the inner wires, shown at D^1 D^1, are transferred from pair to pair of said feeder gears, as the manufacture proceeds.

X Q. 30. In answering cross-question 27, in explaining how marginal wires could be supplied to the fabric when the outer gears were unprovided with center holes and the spools C and the marginal wire therefrom dispensed with, you said, as I understood you, that the wire for the margin could be supplied from stands carrying spools attached to the outermost feeder gears at that side of their axes which would be outside when the gears are at rest, the
431 wires from such spools passing through the adjacent slots of the forward feeder gears and the adjacent slots of the twister gears. As I understood you, this could be done because the spool stands in the outer slots of the outermost feed gears would always be brought to a state of rest at the outside, as two revolutions, for instance, were made in making twists, so that such stands would not be shifted back and forth by the shippers as would the inner stands. Is this correct?

A. That is correct, assuming, of course, with this question, that the spool stands have in the Nesmith machine sliding movement in the slots of the gears, concerning which, however, the Nesmith specification is silent, and only claim six may be said to give a hint.

X Q. 31. Assuming the conditions of the last question and answer, I will ask you how you would provide for the outside or marginal wires if you desired to diminish the width of the fabric to be woven?

A. Easily enough. In that case these outermost supply spools last referred to would be left off, one or both, and if no change is to be made in the shippers, the stand, or stands, at the outer ends of the employed series would be thrown outward into the gears carrying no stands, and, therefore, would be revolved, when thus thrown
-1 outward, without being twisted with any other wire. They would then be thrown inward by the shippers and be twisted with inner wires which would be thrown outward at the same time into the same gears with them. The somewhat greater deflection of the marginal wire would be taken up in the forward feed of the fabric, drawing it straight, as before.

X Q. 32. As I understand your last answer, the stands carrying the wire which forms the margin would, in this diminished width of fabric, be moved by the shippers back and forth, or in and out, in the slots of the two pairs of contiguous intermeshing gears between which the stands were placed. Is this correct?

A. That is correct, assuming no reduction in the number of shippers.

X Q. 33. Do you consider the sixth claim of the Nesmith patent broader with the words "or without" in it than if
432 they were absent, the claim remaining in other respects the same?

A. I do.

X Q. 34. This sixth claim says that the gears have slots cut in them "for the receiving and sliding of the ends of the stands and wires in the same." Is not the word "sliding," in your opinion, a misprint for "guiding," and what, if any, change in the meaning of the claim would this make, in your opinion?

A. The question suggests a new idea to which, of course, I have given no thought. At this moment I see nothing in the specification or drawings calling for such a change or supposition, and I do not see that the claim would be materially different if the word "sliding" were changed to "guiding." Perhaps counsel may bring something to my mind which would lead to a different conclusion. The fact is the specification does not describe, and the drawings do not show, in what manner the spool stands I engage with the feeder gears E and X, and in this line of cross-inquiries I have assumed the sliding relation of the parts shown in defendants' model of the Nesmith feeder to be correct, I having said concerning that construction in my direct — that for aught I know it may be correct, though manifestly it may not be, since the specification is wholly silent on the point and the drawings give no light thereon. If that be the real construction, the sixth claim would apparently fit it, and it appears to me would equally fit it whether the word be "sliding" or "guiding."

X Q. 35. If we take the feeder of the Nesmith patent and building it of working size and operate it, could we not build a diamond-mesh wire fencing having marginal longitudinal wires, assuming, of course, that a proper take-up or roll be arranged in front to hold the wires taut and draw them forward as there already is shown and described in the Nesmith patent?

A. This question, as I understand it, assumes the abolishment of the present twister gears J of the Nesmith patent and calling upon the front feeder gears X to do the twisting, perhaps moving them forward into the position of the present twisters and possibly making other changes to carry out the present general purpose of the machine. I see no reason why the slotted gears X might not
433 with such changes be made to do the twisting and to give a fabric like, but with larger meshes and greater width for a given number of meshes, to the one made by the machine having the special twisters J J.

I observe that the radial slots in the feeder gears are considerably wider than those in the twister gears, suggesting that they may possibly be intended to accommodate something else than the wires while giving passage to the latter, as, for example, the ends of the reel stands, or some sort of projections thereon. I also observe that the slots in the actual twisters J have their bottoms made convergent and that the gears are thickened to more widely support the wires being twisted thereby, while in the forward feeder gears X these features are absent. I, of course, am unable to say how vital these features may be to a practical machine of this type, but I think there is no doubt that the revolution of wires projecting through the slots of the feeder gears X would twist them.

X Q. 36. As I understand your answer, it amounts, briefly, to this, that you see no reason why we could not take the machine of the Nesmith patent and remove the part called the twister, leaving the other parts, and then weave a diamond-mesh fence fabric with longitudinal marginal wires, the fabric being wider and the meshes

larger, however, than when the twister is employed. Does this state your position with substantial correctness?

A. That is not quite correct. Omitting, for brevity, the references I have made to other changes, I have meant to say that, retaining the general mechanisms of the front half of the machine called the "twister" by Nesmith, but omitting therefrom the twister gears, thus throwing the work of twisting upon the front gears X, of the "feeder," such a fabric, in general terms, would be produceable by the machine.

X Q. 37. To state my question differently, do you see any reason why we could not take the part of the Nesmith machine called by him the "feeder," and, with suitable take-up mechanism to draw forward the wires and take care of the fabric, and, with such mechanism, weave a diamond-mesh fence fabric with two longitudinal marginal wires, but of somewhat greater width and of somewhat greater size of mesh than the fabric which would be woven when the part called the "twister" was used?

434 A. I do clearly see why the machine would not then weave such a fabric.

X Q. 38. If we take the part of the Nesmith machine called the "feeder" and use means for causing proper shifting of the spools and wires and means for drawing forward the wire and taking care of the finished fabric, is there any reason why a diamond-mesh-wire fence fabric cannot be woven by it, but of greater width and of larger mesh than when the twister gears are used?

A. Assuming the question to provide in the present feeder such changes and such mechanisms as will make it substantially the present Nesmith machine as to its various functions, except the gears J J it becomes substantially what I supposed it to be in my answer to X Q. 35, in which case I see no reason why such a form of fabric will not be produced by it.

X Q. 39. Are you aware that the Conner machine has been built and used with a set of gear twisters in front of it so that spools carrying a greater quantity of wire could be used while weaving a mesh of narrower width than would permit such size of spools unless the machine were constructed as I have indicated?

A. I am not.

X Q. 40. Have the complainants never informed you that they have so built and used the Conner machine, and have they never shown you a machine so built not in use?

A. They have not.

X Q. 41. If we should remove the feeder of the Nesmith machine and should place the Davisson behind the twister of the Nesmith machine and operate the parts, would not the Davisson machine perform the function and do the work of the feeder of the Nesmith machine?

A. The two machines, to wit, the Davisson and the twister of the Nesmith machine, would not go together in the manner referred to and realize the purpose or the capabilities of the Davisson machine, to say nothing of the fact that the association of the two would be purposeless and would defeat the operation

of which the Davisson is entirely capable by itself. The two machines would not go together and realize the purpose and capability of the Davisson machine because the Davisson provides hollow spindles for all its twisters so that
435 special marginal wire may be supplied to fabrics of all widths and also so that, in addition to such marginal wires, parallel intermediate tension wires may be supplied through all, or as many as desired, of the diamond meshes and through the twists by which the mesh wires are joined to each other. The Nesmith machine contemplates and provides central holes through the two outside slotted twister gears only and, consequently, only the two hollow spindles of the Davisson corresponding with these could be utilized. Any narrower fabric would be destitute of one or both of the special border wires and any fabric of whatever width would necessarily lack the intermediate tension wires referred to.

X Q. 42. If we remove the feeder of the Nesmith machine and in its place put the Davisson, the Kitselman, the Conner or the Pope machine, arranging their gears and the twister gears of the Nesmith machine in the same plane, whether vertical or horizontal, and then operated the machine which was put in the place of the feeder synchronously, or in harmony with the twister of the Nesmith machine, could we not weave a diamond-mesh fence fabric having longitudinal margin wires?

A. Understanding the question to suppose the employment of the Davisson, the Kitselman, the Conner or the Pope machine as a mere feeder of wires to the twister of the Nesmith machine, to the more limited extent that the Nesmith's twister is capable of using wire than either of the supposed wire-supplying machines is capable of furnishing them, and operating the twister of Nesmith in harmony with the machine thus employed to feed it, a fabric can be made such as could be made with the complete Nesmith machine, but not such a fabric as could be made complete by the Davisson, Kitselman, Conner or Pope machine, used alone and by itself. In other words, the useless introduction of the Nesmith twister would be an impediment to the capabilities of such Davisson, Kitselman, Conner or Pope machine.

This qualification should be made to the foregoing, that the Kitselman and the Pope machine, being field machines, do not contain reels for the supply of longitudinal tension wires (border wires or intermediate wires), and are, therefore, in this form, in-
436 capable of supplying such wires without the addition of spools or reels for that purpose, such as would be the case were they loom or factory machines.

In making the foregoing answer, I have made no account of possible practical difficulties due to incidentally different forms of movement between the revolving parts of the Nesmith "twister" and the revolving parts of the other machines referred to.

X Q. 43. The mesh-wire carrying spools D of the Nesmith patent are mounted on the stands I so as to be located between the gears E and X. These stands, I, could be prolonged so as to extend out in front of the gears X and the spools D mounted on them in front of

the gears X, and the spools D thus brought closer to the twister gears J, could they not?

A. In violation of good mechanical judgment and with no object or utility, but in the face of obstacles and at the expense of alterations in a direction away from simplicity and compactness, and especially with the aid of the Davisson machine and for the purpose of counsel to creep along, step by step, towards the Davisson invention, that might be done.

X Q. 44. The feeder gears E and X of the Nesmith patent are represented as slotted clear through, are they not?

A. They are.

X Q. 45. All that would be necessary then to transfer the mesh-wire spool-carriers D in front of the slotted gears X would be to prolong or extend the spool stands, I, forward in front of the gears X and mount the spools, D, on them. Is not this correct?

A. I think not. The reduced ends of the present spool stands, supposing them to be fitted to enter the slots in the feeder gears, while sufficient in size to support one end of the spool stands in the present construction wherein no lateral strain falls upon the spools, would be insufficient to support a forward projection of the stands carrying a spool which would then be subject, even in the presence of the Nesmith twisters, to some lateral strain, and it consequently would be necessary to enlarge the slots in the feeder gears X and correspondingly strengthen the stands where they pass through said slots. The stands thus projected and made to carry spools in front of the gears X would also need to be very firmly sup-
437 ported and held in or to the rear feeder gears E. The Nesmith patent does not disclose by what means said stands are now held to the bottoms of the gear slots, and it is therefore impossible to say whether these holding devices, if any there are, would need to be changed in character or efficiency.

Adjourned until tomorrow morning at 10 o'clock.

MARCH 10, 1899—10 o'clock a. m.

Met pursuant to adjournment; present: same as before.

MELVILLE E. DAYTON—Cross-examination continued.

By Mr. BANNING:

X Q. 46. If a mechanic had been told to arrange the woof spool-carriers D in front of the feeder gears X of the Nesmith patent, could he not have done so by simply extending the spool stands, I, through the slots in the gears X and mounting the spools D on such extended portions and secured the necessary strength to the parts by enlarging the slots in the gears X and enlarging the stands I correspondingly, and would not the operation of the machine, with the spools in such new position, have been the same as before such change?

A. Here are three questions. Answering them in their order, a mechanic, under instructions to bring the spools forward from be-

hind the feeder gears X to a position in front of them, would probably first think of doing so by extending the spool stands through the slots, as suggested in the question; but, second, he would find the necessary enlargement of the stand where it passes through the slot of the gear could not practically be obtained by an enlargement of the slot because the enlargement of the slot involves the cutting away of the gear teeth. This will not do, as he would see, and the only enlargement of the slot possible or practicable would be to the size of the space or notch between two adjacent teeth of the gear. The Complainants' Exhibit, Nesmith Model, represents about half the number of twisters, and therefore about half the number of feeder gears that would be present in a full-size machine, and it is fair to say that, if enlarged proportionately throughout, the slots in the gears which now occupy the space between two
438 adjacent teeth, would become only about five times its present width. Such a width of slot would not, in my judgment, be at all adequate to accommodate a properly rigid and strong extension of the spool stand such as is suggested in the question.

Suppose, thirdly, the spool stands to be, in fact, extended through the gear slots as suggested, and that, in fact, when so extended, they are strong enough, and also that suitable holding devices are provided at the extreme rear ends of the stands, the operation of the altered construction, considered as a feeder for the anterior slotted-gear twisters, would not be materially different from the present construction. That is to say, the spools in their new position would carry the wires back and forth and around in harmony with the present movements of the wires produced at the twisters and in harmony with the rotary movements of the twisters themselves.

X Q. 47. Mr. See and yourself have frequently spoken about the desirability of the arrangement of the woof-wire spools in front of the gears. I am going to ask you to look at this patent No. 504,984, issued September 12, 1893, to Alva L. Kitselman, one of the complainants in this case, to see if he has not himself arranged the woof-wire spools in the rear of the gears? I call your attention particularly to figure 2 of the patent.

Objected to as irrelevant and incompetent, and among other reasons because the patent referred to is not in evidence and has not been referred to in the direct examination of the witness.

A. In the patent handed me the woof-wire spools are shown at the rear of slotted twisting gears, the position they occupy in all machines of the older art employing such slotted twisting gears. There is nothing in this patent calculated to change my opinion as to the desirability of abolishing slotted twisting gears and bringing the mesh-wire spools forward of non-twisting driving gears and making the spools themselves the twisters, as has been done in all of the complainants' machine exhibits, including defendants' machine, in this case. The 1893 Kitselman patent just handed me appears to represent the production of a portable machine of the slotted twister-
439 gear type, in which the mesh-wire spools are *not* the twisters and in which they are necessarily behind the slotted gears which *are* the twisters.

X Q. 48. In this complainants' model of the Nesmith model, or such of it as was left after the fire, the feeder and the twister are both screwed onto a common base. Was this done as a matter of convenience, or because the Nesmith machine is built on a common base?

A. It was done to hold the two divisions of the machine in the relation in which they are shown in the Nesmith patent drawings and in which they necessarily stand to make up the complete operative machine.

X Q. 49. Taking the Nesmith patent and looking at the machine as it is illustrated and described, does it not consist in the use of two machines, one called the feeder and the other called the twister, placed in a certain relation to each other and so that they can be operated by common driving mechanism to work synchronously or in harmony?

A. I think the fact is better stated by the Nesmith patent, which states, near the top of column 2 of page 1, that the machine is "composed of two parts connected together by two shafts, as seen "at P and Q, Fig. 1, and of the said parts I call the 'twister,' the "frame of which is shown at A A, Fig. 2. The other part I call the "'feeder,' the frame of which can be seen at B B, Fig. 2." He precedes this quotation by speaking of my "netting machines," in the plural, and says that "it will be seen by an examination of the drawings that the same are composed of two parts connected together," etc., as above quoted. He, of course, means that each one of these machines is so composed of two parts. And this he more distinctly declares in the second paragraph of the specification, where he says:

"Of the said drawings Fig. 1 shows a plan. Fig. 2 denotes a side elevation. Fig. 3 denotes an elevation of one of the parts of my netting machine, which may be called the 'feeder.' Fig. 4 is an elevation of the other principal part of my machine, and
440 which I call the 'twister.' Figs. 3 and 4 show the two principal parts of the said machine as disconnected from each other, or an inside view or elevation of each part when they are connected to each other."

Fig. 1 shows the two parts in plan connected together and at work, the "feeder" delivering wires to the "twister," and each part performing its share in the work of the complete machine. Fig. 2 shows the same entire machine in side elevation. Fig. 3 shows a rear view of the front part or "twister," and Fig. 4 shows a front view of the rear part or "feeder," the other part being removed in each case to permit this view.

X Q. 50. Does the feeder shown and described in the Nesmith patent require for its operation the particular twister shown and described, and does the twister shown and described in the Nesmith patent require for its operation the particular feeder shown and described? or could either one of these parts be removed and another substituted in its place?

A. The slotted gear twister of the Nesmith machine requires some sort of a feeder supplying all the wires to the twister gears from be-

hind the latter, and the feeder of that machine requires some sort of disk twister through which the wires are to pass from behind. Unquestionably either the "twister" as a whole or the "feeder" as a whole may be modified and yet operate in conjunction with the unchanged other part of the machine.

X Q. 51. The feeder and the twister of the Nesmith patent could be arranged several feet apart, if desired, without modifying the operation or changing the result, could they not?

A. Yes. They are shown placed a distance apart corresponding with about three feet, I think, in a full-size machine, some such distance being desirable in view of the fact that the series of twisters is less in length than the series of feeder gears. The separation of the feeder from the twister at a considerable distance, as shown in the patent and model, prevents too sharp deflection of the wires from the outside feeder gears to the appropriate gears of the twister.

X Q. 52. The only connection between the feeder and the twister of the Nesmith patent is through means of two rotating shafts
441 P and Q, which operate as the driving shaft. Is not this correct?

A. That is true, in the obvious sense of the question.

X Q. 53. Look at this "Defendants' Exhibit Nesmith Model" and point out, if you can, any particular feature, detail or arrangement that is contrary to or not permitted by the specifications and drawings of the Nesmith patent.

A. First, conspicuously, the holes through the intermediate gears E and X, or, in other words, other than "the four outside gears E E and X X." Second, the provision of vertical slots through the central V-shaped shippers which permit the holes through the middle pair of gears E and X to allow the introduction through them of a longitudinal tension wire, said slits in the shippers being nowhere shown or mentioned in the Nesmith patent. With respect to the other pair of V-shaped shipping plates the model referred to corresponds with the patent drawings in showing no such slits and in thus making the central holes through the second pair of gears from each end positively unusable for the passage through them of such tension wires. Where the model corresponds with the patent, therefore, it shows that the variation from the patent consisting in the provision of central holes through any intermediate gears is unwarranted by, and positively inconsistent with and contradictory to, what the patent shows. What the patent shows and describes are holes through the "four outside gears" for special border wires, with an arrangement and form of the shippers permitting the use of these four holes, and no holes through either of the other pairs of gears, along with a form of the shippers which makes the use of holes through the intermediate gears impossible.

The foregoing are unquestionably variations in the model from the Nesmith patent, in my judgment, and, in my opinion, they discredit said model altogether as a representation of the Nesmith feeder construction.

Relative to the manner in which the spool stands are mounted in the front and rear feeder gears of the model referred to, the patent is

silent and the drawings are obscure. It is impossible, therefore, for me to say that the model does not accord with the original model filed with the application and, to this extent, with the Nes-
442 mith patent. But the Nesmith patent drawings show certain projections on the approximate faces of the front and rear feeder gears which are also seen in the certified Patent Office model, these projections or studs having what appear to be springs connected with them which are probably in some way concerned in the retention or attachment of the spool stands in or to said feeder gears. Nothing of this sort is shown in the defendant's model referred to.

I omit reference to the situation of the hand-driving shaft in the model as being different from that of the corresponding power-driving shaft shown in the patent drawings, except to say that the situation of the power shaft in the patent drawings does not call for the open-topped slits or slots in the middle pair of one of the two sets of shippers, so that there is no warrant whatever for said slits as shown in the model. I refer to this feature also as a basis for the statement that, if the model had been made to accord with what the patent shows and describes, there would not only be no holes through other than "the four outside feeder gears," but that holes through any of the intermediate gears would be unusable, as two pairs of said holes are even now unusable in said model.

X Q. 54. As I understand your answer, you consider the defendants' model of the feeder of the Nesmith patent contrary to the drawings and description of such patent, first, in having all of the gears E and X provided with central holes; second, in having the middle pair of one set of shippers provided with open-topped slits, and, third, in omitting to provide the gears E and X with the studs or projections on their faces for springs which you think were possibly intended to hold the spool stands in the slots of the gears. Is not this correct?

A. It is.

X Q. 55. If it were decided by Nesmith, or any one using his machine, to provide all of the gears with center holes so that intermediate longitudinal tension wires could be employed in the fabric, would it not be obvious that the shippers should be provided with open-topped slits to straddle such intermediate tension wires?

Objected to as irrelevant; and the objection is extended
443 generally to the class of questions which are aimed at reconstructing old machines upon plans not found in them or in the patents relating to them.

A. He would certainly find that he would need to provide such slots in the shippers after making the central holes through the gears referred to, and, except that it does not appear to have been altogether obvious to Mr. Wiles, who made or caused to be made the defendants' model and who is a good mechanic, I should say that, after the holes are provided, the slits would be an obvious necessity.

X Q. 56. In one of your answers I understood you to imply that the mesh-wire spools might be the twisters. As a matter of fact, the mesh-wire spools, by themselves never are the twisters, are they?

A. Counsel informs me that the answer to which he refers is that to cross-question 47. Where I there said that the mesh-wire spools "are *not* the twisters" in the Kitselman 1893 patent there being considered, I meant to distinguish that construction from the Kitselman, the Davisson, the Conner and the Pope patents in suit, wherein the mesh-wire spools are *of* the twisters, and *are* the twisters in the sense that they directly carry the mesh wires around each other and around the longitudinal wires. In all these constructions where the mesh-wire spools are thus made the twisters they are invariably accompanied by guides for the wires interposed between the spools and the points where the twists are made, such guides for the wire taking a part with the spools in making the twists and especially in making a symmetrical twist by delivering the wire always at the same point to the several twists. Such guides in the Davisson patent are the holes through the cylindric spool cases. In the Kitselman and the other machines here concerned, including the defendants' machine, they are holes in forwardly arranged parts of the spool-carriers. I think such guides are a necessary accompaniment of the twister spools in a practical machine. The spools in the Davisson and the above-mentioned subsequent machines are the twisters in a very distinct sense as compared with revolving feeder spools of machines having slotted or perforated and divided twisters, in which machines such spools are not twisters at all, but mere anti-tanglers. In such disk-twister machine the feed-
444 ing spools need have no revolutionary movement at all, if only the twister disks reciprocate, making one twist in one direction and the next in the other, and the wires are supplied from stationary spools far enough back to permit such back-and-forth twisting movements of the twister disks. The Nesmith twisters, having these oscillatory movements, the feeder of that machine could be entirely dispensed with by giving sufficiently long distance through which to pass wires through them from stationary reels.

By this illustration I have sought to emphasize the fact that in the Davisson and other machines concerned in this controversy the mesh-wire spools are made essential elements of the twisters themselves, and strictly *the twisters* themselves, by their new position in front of the gears which revolve them and adjacent to the point where the twists are made.

X Q. 57. I will ask you to again point out the particular parts in the defendants' machine which, in your opinion, correspond to the cross-heads of the Davisson patent.

A. The cross-heads of the Davisson patent are the parts which immediately revolve the mesh-wire spools in front of the gears for giving such revolution. There are two such laterally projecting revolving parts in each of the twisters of the Davisson patent; one is the gear itself and the other the arms connected with the gear by the spindle which therefore rotate with the gear. For all mechanical purposes in the revolution of the mesh-wire spools, these two devices, to wit, the gear and the cross-bars or arms, are the same, all that is required to utilize either being the provision of means for attaching the spool-carriers to whichever of these revolving devices

shall be selected, the claims of the Davisson patent being broad enough, in view of the pioneer character of that invention, to cover the use of one or the other of these devices. Defendants' machine connects the spool-carriers with the gears, and the gears in defendants' machine, therefore, answer to the cross-heads of the Davisson patent.

X Q. 58. In the Nesmith machine and in the Davisson machine the mesh-wire spools are shifted by direct lateral movement and the shifting always occurs when the spools are between lines projected from the centers of the gears. Is not this correct?

445 A. It is.

X Q. 59. Is not this also true of the Conner machine and the defendants' machine, so far as respects their position at the time of transfer?

A. It is. The difference between the Conner and defendants' machine, on the one hand, and the Davisson, or the Davisson and the Nesmith, on the other hand, being that there is no bodily movement of the spools in the Conner and in defendants' machines from the prolonged axis of one gear to the prolonged axis of the next, due to the fact that there is no difference between the orbits of the spools and the pitch lines of the interengaging gears, and that no means are called for in the Conner system, adopted by defendants, for carrying the spools out of one orbit before entering the other. The two orbits coincide or touch midway between the axes of the gears.

X Q. 60. In view of the fact that the gears E and X of the Nesmith feeder rotate in harmony, would their action or mode of operation be affected by having them coupled together in pairs with rods or bars, say two for each pair, running parallel to their axes, but arranged at the sides not cut by the slots already in the gears?

A. They would not operate at all, if thus connected, by which I mean that the machine would be rendered inoperative by inserting such connections. As is made clear by the defendants' model, the wedge-shaped shippers alternately rise in front of and entirely cover the gears from which they have expelled the spool stands, so that there is no possibility of connecting the front and the rear gears of the feeder in the manner proposed.

X Q. 61. As the gears E and X of the Nesmith feeder rotate in harmony, could they not be connected together in pairs by rods or bars running parallel with the axes of the gears and connecting them at the sides which are unprovided with the slots, if the shippers were provided with open-topped slits adapted to straddle such rods or bars as they were moved up?

A. They could.

X Q. 62. In that case, we would have the gears connected together as shown in Defendants' Exhibit Illustrative Drawing, where the bars are represented by dotted lines, would we not?

A. That is as I understand it.

446 X Q. 63. When the gears are connected together as in the last two questions and answers, would the operation of the machine be materially affected?

A. When the gears are thus connected together and the shippers modified by the provision of open-topped slits to permit said shippers to rise and fall for the shifting of the spool stands, the machine would still be entirely inoperative and incapable of any rotary movement whatever, because the supposed connecting bars would then be embraced in the slits of the shippers which would lock the gears against possible rotation. This is apparent from defendants' model when the shippers in which slits have been unwarrantedly provided are brought up into position to straddle such supposed connecting bars.

X Q. 64. As the gears E and X of the Nesmith feeder rotate in harmony, could they not be connected together in pairs by slender tubes arranged concentric to their axes if the shippers were provided with open-topped slits adapted to straddle such tubes as they were moved up and down?

A. The use of central connecting tubes or bars small enough to be straddled by an allowable size of slit in the shippers would obviate the objection last referred to, I think, and I do not now see why such connecting tubes or bars might not be introduced, along with the provision of the slits referred to for their accommodation.

X Q. 65. If, for example, we took the outside gears E and X of the Nesmith feeder, which you admit are or may be provided with center holes, and connect them together by central tubes, we would have in the Nesmith feeder two pairs of gears connected by hollow tubes, with longitudinal wires running through them, would we not?

A. We would.

I want to say in extension of my last preceding answer that an inspection of figure 1 of the Nesmith patent drawings shows that the intermediate spools, or some of them, narrow as they are there shown to be, are brought into the line connecting the centers of opposite feeder gears so that such intermediate gears could not be connected by the supposed center tubes or bars. I point particularly to the spool D, which is directly above the shaft Q, as
447 being in the vertical plane and in the line of the centers of the two gears E and X in front and rear of it.

X Q. 66. As I understand, the explanatory part of your answer above has reference to the intermediate gears and intermediate spools. Is not this correct?

A. It is.

X Q. 67. The use of center tubes to connect all of the gears E and X together into pairs simply depends upon the depth of the slots and the size of the spools, does it not?

A. Theoretically, that is true. Very shallow slots and very thin spools would undoubtedly accommodate small tubes connecting all of the front and rear gears, but whether such spools would be large enough to be practicable is a question I am unable to determine. Doubtless Nesmith went over this entire matter and determined that the construction he shows is the proper one.

One thing to be noticed is that the two outside spools of the series

shown in Fig. 1 of the Nesmith are on those sides of the spool stands where they are out of the way of the border wires which he proposes to pass through these gears, and probably out of the way of a small, thin tube connecting these two pairs of gears and giving passage to said border wires. The same conditions do not hold, I think, as to the intermediate gears carrying mesh-wire spools of practicable size.

X Q. 68. Without discussing the question of depth of slots or size of spools, do you see any reason why the outside pairs of gears E and X of the Nesmith feeder might not have been provided with hollow tubes connecting them together so that the margin wires would pass through the tubes as well as the gears?

A. I do not.

X Q. 69. In the case covered by the last question and answer the tubes would revolve with the gears. Is not that your understanding?

A. They would revolve with the gears if they were fastened to them, and if that is what counsel meant to specify in his questions, the tube would revolve. Of course, they might be extended through holes in the gears and held against rotation by any suitable attachment of the rear projecting end to the frame.

448 X Q. 70. In a word, the tubes might be made either stationary or rotary, depending upon whether they were made fast to the gears or passed through holes in the gears, and made fast to the frame by some auxiliary means?

A. That is true.

Redirect examination by Mr. PARKINSON:

R. D. Q. 71. Having reference to the purposes of the Nesmith machine, would there be any object in putting the tubes in as referred to in the last question, and do you find any suggestion in the patent of their introduction?

A. There would be no object accomplished or useful end served by the introduction of such tubes, and there is no suggestion of their introduction in the patent.

R. D. Q. 72. Referring to your answer to cross-question 16, what, if any, information have you concerning the matter there inquired about beyond such inferences as you may have drawn from the biographical sketch introduced by defendants?

A. The brief answer referred to is to the effect that I thought it "probable" from what I had been told that Nesmith had some sort of a machine by which he manufactured light fabric for poultry fencing, such as I had known of prior, at least, to the Kitselman patent in suit. I had no definite information to this effect, however, from any source, and only considered it as a possibility, or, it may be, a probability.

R. D. Q. 73. Referring, now, to your answer 56, do you think the operation to which you have there referred, with the feeder of the Nesmith machine entirely dispensed with, would be a practicable one?

A. I am satisfied, on reflection, that it would not be. The sentence of said answer containing that statement and the preceding sentence are both incorrect as to the possibility of dispensing with revolving mesh-wire spools in connection with disk twisters, because, as for the moment I there failed to consider, the mesh wires are shifted after one twist so as to be next twisted with other wires. It is only in that class of twisting devices, such as are used in twisting the stringer wires of "wire-and-picket" fencing, wherein the two wires forming the stringer are always twisted with each other, that revolv-
449 ing spools can be dispensed with. I was also in error, for the moment, in saying that the Nesmith twisters oscillate, or rotate in opposite directions in making succeeding twists. They might do so, but, as in fact shown, they have an interrupted rotary motion in the same direction.

I made these statements for illustration and their force for this purpose is of course destroyed by the present correction, but the fact remains that "in the Davisson and the other machines concerned in "this controversy, the mesh-wire spools are made essential elements "of the twisters themselves and strictly the twisters themselves, by "their new position in front of the gears that revolve them and ad-"jacent to the points where the twists are made," as I there and have heretofore stated.

Complainants here offer in evidence the sketches introduced and referred to by this witness in answer 4, marking them as Complainants' Exhibits with the names therein specified, to wit, "Dayton's Sketch of Prior Twisters," "Dayton's Sketch of Prior Fabrics," "Dayton's Sketch of Prior Machines" (two sheets), "Dayton's Sketch of Davisson Invention" and "Dayton's Sketch of New Fabric."

(Signed) MELVILLE E. DAYTON.

Adjourned.

CHICAGO, *April* 12, 1899—11 o'clock a. m.

Met pursuant to agreement.

Present: Robert H. Parkinson, Esq., on behalf of the complainants; Thomas A. Banning, Esq., on behalf of the defendants.

ALVA L. KITSELMAN—Recalled by Mr. PARKINSON.

Q. 1. What is your name and are you the person of the same name who has before testified in this case?

A. Alva L. Kitselman, and I am the same person.

Q. 2. Were you present at the deposition of Adam Cochrane, for defendants in this case, and did you then see "Defendants' Exhibit Cochrane Machine"?

A. Yes, sir; I was present, and saw the machine known as the Cochrane exhibit.

450 Q. 3. When did you first know that such a machine, or machine of that general character, was being built by the Cochrane Machine Fence Co., or by Adam Cochrane, or either of the persons mentioned in his deposition as connected with him in that business, either at Detroit or anywhere else in this country?

A. I first knew of it from hearing Mr. Cochrane so state in his deposition.

Q. 4. Had you prior to that deposition any knowledge of any machines being made or sold in this country by the Cochrane Machine Fence Co.; if so, what kind of machines?

A. No, sir; I had no direct knowledge of their making or selling any machine in this country. I knew that they were advertising, to some extent, a small hand machine for wrapping vertical wires around line wires in a fence, but had no direct knowledge of their either manufacturing or selling any of those machines.

Q. 5. What, if anything, do you know about Adam Cochrane's having received notice, or having had brought to his attention notice given by you of your claim that machines made under the Morgan patent mentioned in his deposition would infringe the Kitselman patent here in suit?

A. Previous to the purchase of the Morgan Canadian patent by Mr. Cochrane we were informed that the inventor, Mr. E. S. Morgan, together with a man by the name of Neal and two or three others, were preparing to manufacture this machine at Richmond, Indiana. I sent my brother, D. M. Kitselman, to Richmond to investigate the matter. He reported that they were then getting three machines made in a machine shop in Richmond. We at once served notice of infringement on Mr. Morgan and each of the other parties, individually, writing each a letter to the effect that this machine we considered an infringement on our patent No. 356,322, and that we would hold them liable for damages. Mr. Neal and one of the other parties came to our place to see us in regard to the matter. We explained our position fully to them and they did no more towards the manufacture of those machines and the three, to our knowledge, were never completed. I was a witness on the trial in Canada which Mr. Cochrane referred to in his deposition, and
451 the letter I had written Mr. Morgan notifying him of the in-
— fringement was in the presence of a Mr. Adam Cochrane submitted to me for identification on that trial, the same being read before the court in Mr. Cochrane's presence.

Q. 6. Do you know what has become of that letter?

A. I do not.

Q. 7. Mr. Cochrane refers to certain notices being sent out by Kitselman Brothers to the trade. Please state whether or not any of the notices or advertisements put out by you, that is, by complainants, mention specifically the Cochrane Fence Machine Co., or Adam Cochrane, or either of the persons named by him as associated with him as the manufacturers and dealers whose machines were charged to infringe, and whether or not any mention was made of them in these circulars or advertisements.

A. No, sir; there was no mention made of any of them individually or as a company.

Q. 8. Since learning through Cochrane's deposition that his company was making the machines represented by "Defendants' Exhibit Cochrane Machine," what, if anything, have you done, or

caused to be done, toward notifying that company of your rights in the premises and toward asserting your rights against it?

A. We at once consulted with our attorney in regard to serving notice on them and bringing suit against them, but before proceeding in the matter, inasmuch as there was a license out under one of our patents for the county in which Detroit is located, we desired to secure that license and perfect our title to that county before serving notice, which we did, after which we instructed our attorney to serve notice of infringement on the parties and, if necessary, commence suit, and this has been done.

Counsel for complainants produces his letter book showing a notice to the Cochrane Fence Machine Co., 17 Woodward avenue, Detroit, Michigan, under date of December 9, 1898, to the effect that that company is understood to be making and using and selling wire-fence fabric machines which infringe the Davisson
452 patent and Kitselman patent and Conner patent here in suit, and asks defendants' counsel if he will admit that such notice was sent to said company on or about the date it bears, in the ordinary course of mail, postage prepaid.

By Mr. BANNING: Defendants' counsel admits that the notice referred to was sent, and, in the absence of evidence to the contrary, he concedes the same may have been received by the Cochrane Fence Machine Co.

Complainants here produce a copy of the bill of complaint of the complainants herein against Adam Cochrane, Roderick Cochrane, Jane Cochrane, Haggart Cochrane and Roderick A. Cochrane, partners in the Cochrane Fence Machine Co., being a bill in equity in the United States circuit court for the eastern district of Michigan, charging said defendants in the usual form with infringement of the Davisson patent and Kitselman patent here in suit, which bill of complaint is sworn to on the 4th day of February, 1899; also docket entries showing said bill to have been filed February 6, 1899, and appearance for the defendants except Adam Cochrane and Haggart Cochrane, to have been entered March 6, 1899; also a letter of the marshal of that district stating that he was unable to get service on Adam and Haggart Cochrane; that they do not reside in Detroit, but he thinks their present residence is in Omaha; also the answer of the defendants other than the two above named, which appears to have been sworn to April 3, 1899, and which he states he understands to have been filed on or since that date: and asks defendants' counsel if he will admit that suit was commenced and answer filed as herein stated, and that the marshal has reported concerning failure of service on Adam and Haggart Cochrane, as above stated.

By Mr. BANNING: Counsel for defendant- replies that he does so admit.

Q. 9. Did you attend the World's Fair Exposition at Chicago?
A. Yes, sir; I did.

Q. 10. Adam Cochrane refers to one of their machines as
453 having been exhibited there. Did you, or did you not, see or know of such an exhibit?

A. I did not see or know of any such exhibit.

Cross-examination by Mr. BANNING:

X Q. 11. You were present, I believe, during the examination of Mr. See and Mr. Dayton, in rebuttal, wherein they considered and discussed the Nesmith 1854 patent, were you not?

A. Yes, sir; I was.

X Q. 12. Did you ever read the claims of the Nesmith 1854 patent as they are published in the Patent Office reports for the year 1854?

Objected to as not relevant to the direct examination or to the issues herein.

A. Yes, sir; I have.

X Q. 13. When did you read such claims?

A. I cannot give the exact date, but some time after this suit was commenced.

X Q. 14. Was it before Mr. Dayton and Mr. See gave their testimony in rebuttal?

A. Yes, sir; it was.

X Q. 15. Did Mr. See and Mr. Dayton read those claims also?

The above objection is continued to all this line of examination.

A. Well, I suppose they did, but I do not remember now of their reading aloud in my presence all of them; but they certainly read them over.

X Q. 16. The sixth claim of the Nesmith patent, numbered 10,743, of April 4, 1854, as published in the Patent Office reports for the year 1854, reads as follows, does it not, viz:

"6th. The feeding and twisting gears J E X, with their centers perforated to admit the border or warp wires passing through the same, and the said gears having slots cut in them for the re-
454 ceiving and guiding the ends of the stands and wires in the same, substantially as set forth," etc.

A. Yes, sir; I believe it does.

ALVA L. KITSELMAN.

Complainants here produce a letter dated Nov. 7, 1892, addressed C. A. Snow, signed by John C. Pope, and stamped as received by C. A. Snow & Co. November 11, 1892; also a letter dated March 6, 1893, similarly addressed and signed, with a description attached thereto; also a photograph purporting to be signed by John C. Pope, Fox, Ill.; also a drawing in two sheets; also an envelope purporting to be the solicitors' file of an application of John C. Pope, of Fox, Ill., having endorsed thereon as follows: "John C. Pope, Fox, Ill. Wire-fence machine. Ans'd about caveat 9-30-92. Photograph rec'd 11-12-92:" and asks defendants' counsel if, upon inspection of the same, he will admit that the letters and description were written by the John C. Pope, patentee of the Pope patent

herein, and received by his Washington solicitors, C. A. Snow & Co., on or about the dates indicated; also that the photograph received November 12, 1892, is the same as the photograph identified by Mr. Pope during his deposition, or rather a duplicate thereof, and that the drawings referred to correspond generally, except as to their lettering, with those of the Pope patent here in suit.

By Mr. BANNING: Counsel for defendants state that all of these matters may be considered as admitted.

The two Pope letters above referred to and the descriptive matter attached to the latter are offered in evidence, and it is agreed that the examiner may make copies thereof to be used with the same effect as the originals, which originals may be retained by complainants' counsel. The letters and description are as follows:

"FOX, ILL., *Nov.* 7, 1892.

"Mr. C. A. Snow.

"DEAR SIR: I will mail you a photograph of a machine 455 for makeing woven-wire fence. There is a gro-ved wheel driven by a gear attached which by the use of the crank throws the grooved wheel in perfect line which *i*nables the shuttle or spool-holder to be throwen from one wire to the other up or down passing throw the wheel from one to the other.

"I would like to have you make a se-rch and see if it is patentable or not. If it is patentable I will *prec*ead at once I am perfectly satisfied with the business you did for me before.

"JOHN C. POPE,
"*Fox, Ill.*"

"FOX, ILL., *Mar.* 6, 1893.

"Mr. C. A. Snow.

"DEAR SIR: I enclos*e*d d*i*scription and draft of my machine. If this is satisfactory and will ans- your purpose pleas- let me know immediately and I will for*d*ward the money neces-ary to go ahead Pleas- let me know the expence of getting a pat- with this draft. If my description will not do I will ans- any question you ask immediat-ly.

"Yours truly, "JOHN C. POPE,
"*Fox, Ill.*"

"Mr. John C. Pope, Fox, Ill.:

"Please write on this sheet a description of your invention in your own way and language, stating what you claim as new and original, and how it is operated, and the advantages of your invention over others.

"Yours truly, C. A. SNOW & CO."

"'I can start at a post without the means of a starter. Which no other machine can. Another point is it is not so complicated as other machines. Simply being a chain of gears. It is he*a*led by an arm which is hollow to *in*hable the wire to run through the center of the wheel. And is more durible than any other, and is lighter

and more easily handled. The wire can be spliced without
456 obstructing the machine. And if neces-ary can be worked on barb wire:'—

"The frame (E) is 2 by 8 5 ft. high. It is drawn on a track (m) by lever (I) catch (K) which is fastened to the main frame (H. J.) of the two wheels (L.) A hollow tube (G.) is fastened to the main frame (E.) which *in*hables the slott or gru-ved wheels (W.) which turns on the hollow tube (G.) which makes a complete chain of gears from top to bottom. The shuttle or spool-holders (B.) to pass from one wheel to the other by means of the lever (F.) which is thrown up or down from one tube to the other by means of lever (F.) operated slides (D.) shuttle-shifter (C.) which is at-ached to side (D.)"

Complainants here produce a certificate of publication in the Kendall County Record, a weekly newspaper published at Yorkville, county of Kendall, and State of Illinois, of the following advertisement as published Februaryy 10, 1892, defendants' counsel admitting that it may be taken as duly proved that such publication was made as there indicated. Said advertisement is as follows:

"Tuesday, February 16, 1892,

"E. Neff will sell at auction at his residence, 2 miles south of Newark, commencing at 10 a. m., 6 head of work-horses, 15 cattle, 10 being fine milch cows all to be fresh soon; 77 ewes, all to have lambs soon; 2 bucks; 4 brood sows, 3 fat hogs; 1,000 bushels corn in crib, 300 bushels seed oats, stack oat straw, 20 tons timothy hay in barn; Plano binder, 2 mowers, 2 cultivators, hay rake, seeder, drags, plows, corn-planter and check-rower; 2 single-top carriages, 2 double buggies, lumber wagon, 2 pair farm trucks, 1 3-4 road wagon, harness, blacksmith's tools, lathe, carpenter's tools, household goods and many other articles. One year's time on sums over $10.

"H. H. NEWTON,
"*Auctioneer.*"

COMPLAINANTS' EXHIBIT DAVISSON ASSIGNMENT No. 1.

To all whom it may concern:

Whereas, William J. Davisson, of Farmland, Randolph county, Indiana, and Jonathan A. Botkin, of Sevan's Hill, Randolph
457 county, Indiana, did obtain letters patent of the United States for a machine for making wire fabric, and which letters patent bear date of December 4th, 1883, and are numbered 289,507, and whereas, William J. Davisson and Jonathan A. Botkin are now sole owners of said letters patent, and whereas, Edwin F. Kitselman is desirous of acquiring an interest therein:

Now, this indenture witnesseth, that in consideration of one hundred and fifty dollars, in hand paid, the receipt of which is hereby acknowledged, we, the said William J. Davisson and Jonathan A. Botkin, have assigned, sold and set over and do by these presents assign, sell and set over unto the said Edwin F. Kitselman all the

right, title and interest *I* have in and to the said letters patent and the invention thereby secured.

The same to be held and enjoyed by the said Edwin F. Kitselman for his own use and behoof, and for the use and behoof of his legal representatives to the full end of the term for which said letters patent were granted, as fully and entirely as the same would have been held and enjoyed by us, had this assignment and sale not been made.

In testimony whereof we have hereunto set our hand- and affixed our seals this 11th day of March, 1896.

JONATHAN A. BOTKIN.
WILLIAM J. DAVISSON.

Sealed and delivered in presence of—
E. F. KITSELMAN.
J. W. GRIMES.

Endorsed: U. S. Patent Office. Recorded July 2, 1896.

Received for record July 2nd, 1896, and recorded in Liber 053, page 445, of Transfers of Patents.

[SEAL.] In witness whereof I have caused the seal of the Patent Office to be hereunto affixed.

JOHN S. SEYMOUR,
Commissioner of Patents.

Ex'd. A. C. W.

458 COMPLAINANTS' EXHIBIT DAVISSON ASSIGNMENT No. 2.

To all whom it may concern:

Whereas, William J. Davisson, of Farmland, Randolph county, Indiana, and Jonathan A. Botkin, of Swan's Hill, Randolph county, Indiana, did obtain letters patent of the United States for a machine for making wire fabric, which letters patent bear date of December 4th, 1883, and are numbered 289,507, and whereas Edwin F. Kitselman is now sole owner of said letters patent; and

Whereas, Alva L. Kitselman and Davis Monroe Kitselman are desirous of acquiring an interest therein:

Now, this indenture witnesseth, that in consideration of one dollar in hand paid, the receipt of which is hereby acknowledged, the said Edwin F. Kitselman has assigned, sold and set over and does by these presents assign, sell and set over unto the said Alva L. Kitselman and Davis Monroe Kitselman all the right, title and interest in and to the said letters patent, and the invention thereby secured, the same to be held and enjoyed by the said Alva L. and Davis Monroe Kitselman for their own use and behoof, and for the use and behoof of their legal representatives to the full end of the term for which said letters patent were granted, as fully and entirely as the same would have been held and enjoyed by me had this assignment and sale not been made.

In testimony whereof I have hereunto set my hand and affixed my seal this 12th day of May, 1896.

EDWIN F. KITSELMAN.

Sealed and delivered in the presence of—
ROBERT MILLER.
C. M. KITSELMAN.

Endorsed: U. S. Patent Office, recorded July 2, 1896. U. S. Patent Office. Chief clerk, July 2, 1896.

Received for record July 2nd, 1896, and recorded in Liber 053, page 446, of Transfers of Patents.

459 In testimony whereof I have caused the seal of [SEAL.] the Patent Office to be hereunto affixed.

JOHN S. SEYMOUR,
Commissioner of Patents.

Ex'd. A. C. W.

COMPLAINANTS' EXHIBIT CONNER ASSIGNMENT.

Assignment of Territory.

Whereas, Theodore M. Conner, of city of Richmond, of Wayne county, of State of Indiana, did obtain letters patent of the United States for improvements in machine for forming netted-wire fabrics, which letters patent are number 357,067, and dated the first day of February, 1887, and

Whereas, the undersigned are now the sole owners of all rights under said patent, and

Whereas, Alva L. Kitselman and Davis M. Kitselman, of Ridgeville, county of Randolph, and State of Indiana, are desirous of acquiring an interest in the same;

Now therefore, this indenture witnesseth, that for and in consideration of the sum of eighteen hundred dollars to them in hand paid, the receipt of which is hereby acknowledged, the undersigned have sold and assigned, and by these presents do sell and assign, to the said Alva L. Kitselman and Davis M. Kitselman, all the right, title and interest which they have in and to the said invention, the same to be held and enjoyed by the said Alva L. Kitselman and Davis M. Kitselman and their legal representatives, to the full end of the term for which said letters patent are granted, as fully and entirely as the same would have been held and enjoyed by them had this assignment and sale not been made.

In testimony whereof, they have hereunto set their hands and affixed their seals this twenty-eighth day of March, A. D. 1887.

THEODORE M. CONNER. [SEAL.]
THOMPSON M. CONNER. [SEAL.]
JOHN B. DOUGAN. [SEAL.]

460 In the presence of two witnesses:
R. A. JACKSON.
H. C. STARR.

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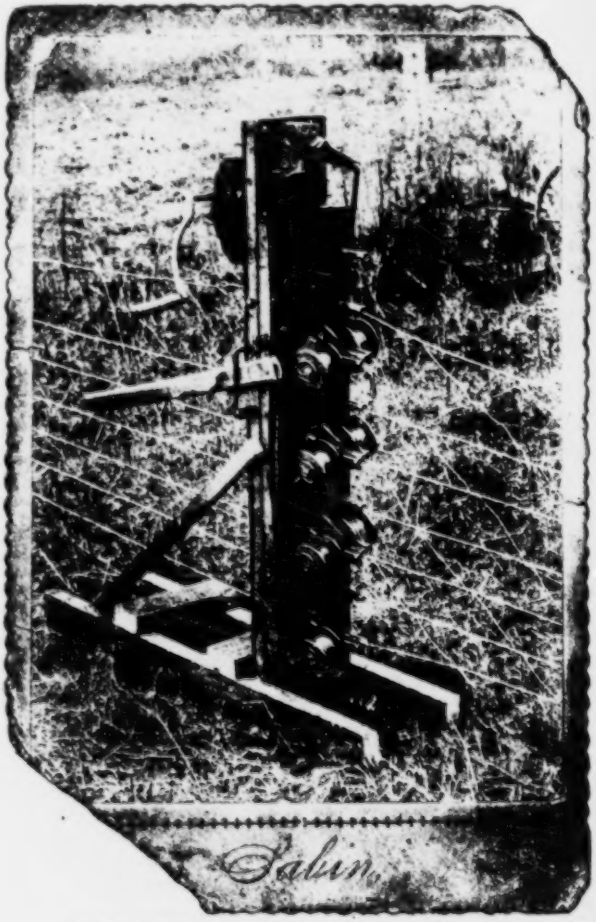

COMPLAINANTS' EXHIBIT POPE'S FIRST MACHINE.

No. 148
Kokomo Co.
v.
Kiefelman
p. 461

Endorsed: Patent Office, July 9, 1887, U. S. A., 14999 Pat. Office, div. D, 1887.

Received for record July 9th, 1887, and recorded in Liber K. 36, page 339, of Transfers of Patents.

In testimony whereof I have caused the seal of the Pat-
[SEAL.] ent Office to be hereunto affixed.

J. B. B. BENTON J. HALL,
Commissioner of Patents.

(Here follows diagram marked p. 461.)

462 STATE OF ILLINOIS, } ss:
County of Cook, }

I, Charles L. Hine, a notary public in and for the county of Cook and State of Illinois, acting as special examiner, do hereby certify that the above witnesses, John E. Frederick, Melville E. Dayton, Alva L. Kitselman, George W. Frederick, Joel Ward, James W. See, John C. Pope, William J. Pope and C. M. Sabin, were by me first duly sworn to testify the truth, the whole truth and nothing but the truth; that their depositions were reduced to writing by me in the presence of said witnesses, respectively, and when completed read over by said witnesses and subscribed by them in my presence and in the presence of such of the parties and counsel as attended; that said depositions were taken, pursuant to agreement, at the office of Robert H. Parkinson, Esq., 1543 Monadnock block, Chicago, Illinois, beginning on the 27th day of July, 1898, and continuing from day to day as set forth; that the parties were represented by their respective counsel, as set forth; that the several exhibits recited were offered in evidence and marked as specially noted in the foregoing depositions; and that I am not of counsel or relative of either party, or otherwise interested in the event of this suit.

In testimony whereof I have hereunto set my hand and official seal this 8th day of May, 1899.

[NOTARIAL SEAL.] CHARLES L. HINE,
Notary Public in and for the County of Cook, State of Illinois, Acting as Special Examiner.

463 DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the records of this office of the file-wrapper and contents in the matter of the letters patent granted Alva L. Kitselman, assignor of one-third to Davis M. Kitselman, January 18, 1887, number 356,322, for improvement in wire-fabric machines.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the city of [SEAL.] Washington this 8th day of April, in the year of our Lord one thousand eight hundred and ninety-eight and of the Independence of the United States of America the one hundred and twenty-second.

C. H. DUELL,
Commissioner of Patents.

APPLICATION FOR LETTERS PATENT.

I.—*Petition and Power of Attorney.*

To the Commissioner of Patents.

SIR: Your petitioner, Alva L. Kitselman, citizen of the United States, residing at Ridgeville in the county of Randolph and State

of Indiana, prays that letters patent may be granted to him for the improvement in wire-fabric machines, set forth in the annexed specification.

And he hereby appoints C. A. Snow and E. G. Siggers, composing the firm of C. A. Snow & Co., of Washington, D. C., as his attorneys, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to receive the patent, and transact all business in the Patent Office connected therewith.

ALVA L. KITSELMAN.

464 II.—*Specification.*

To all whom it may concern:

Be it known, that I, Alva L. Kitselman, a citizen of the United States, residing at Ridgeville in the county of Randolph, and State of Indiana, have invented a new and useful improvements in wire-fabric machines of which the following is a specification:

My invention relates to machines for making twisted wire fabric for use as fencing and analogous purposes; and it consists of the peculiar combination and novel construction and arrangement of the various parts for service, substantially as hereinafter fully set forth and particularly pointed out in the claims.

The primary object I have in view in my invention is to provide a simple and easily operated machine of the class named which can be adapted for use in the open field or other place for the construction of fences as well as a stationary or fixed machine, for the manufacture of wire fabric.

A further object of my invention is to provide a machine of the class specified which can be adapted for the manufacture of different classes or designs of wire fabric and fences when used as either a portable or stationary apparatus without requiring any adjustment or interchange of its parts.

In the drawings hereto annexed which illustrate a wire-fabric machine embodying my invention,

Figure 1 is a side elevation of the machine in its portable form, the same being mounted on wheels and running or traversing on a track, which is placed in the open field or road, so that it is adapted for making or constructing the fence as it is moved or fed along.

Figure 2 is a front elevation with the twisters threaded to form the style of fence illustrated in figure 21.

Figure 3 is a rear elevation with a portion of the casing or main frame broken away to show details of construction.

Figure 4 is a vertical longitudinal sectional view on the line *x x* of figure 3.

Figure 5 is a vertical transverse sectional view looking in the direction of the arrow 1

Sept. 27, '86. on the line *y y* of figure 4

465 Figure 6 is a similar sectional view corresponding

Substitute "A," Sept. 27, '86.

to figure 5 with the slides and the movable sections of the twisters carried thereby shifted so as to be in condition to form one portion of the fence or wire fabric.

Figure 7 is a detail perspective view of one of the sectional twisters, with the parts or sections thereof separated from one another.

Figure 8 is a partial front elevation differing from figure 2 in showing the position of the twisters after the vertically movable frames or slides have been operated.

Figure 9 is a partial side elevation illustrating the position of the slides or vertically movable frames after they have been adjusted.

Figure 10 is a partial front elevation showing a different manner of threading the twisters.

Figure 11 is an elevation taken from one side of the fence that is made by the machine when it is threaded as shown in figure 10.

Figure 12 is a partial front elevation showing another method of threading the twisters.

Figure 13 is an elevation of the plan of fence made when the machine is threaded as shown in figure 12.

Figure 14 illustrates another plan of threading the twisters.

Figure 15 is a view of the style of fence made by the machine when it is threaded as shown in figure 14.

Figure 16 is a view of another style of fence with the corresponding plan of threading the disks or twisters.

Insert "B," Sept. 27, '86.

Figures 17, 18, 19, and 20 are views of additional styles of fencing which may be made with my machine. A

Referring to the drawings, in which like letters of reference denote corresponding parts in all the figures:—

A designates the main frame or casing of my improved wire-fabric machine. When the apparatus is to be constructed in portable form so that it is adapted for use in the open field, road or other place for putting up or constructing fences as the fabric is turned out or manufactured by the same, the carrying frame A comprises the vertical standards or uprights a a and a^1, which are arranged parallel with each other and connected and braced by suitable cross or 466 transverse pieces a^2; but the shape of this frame is immaterial and I would have it understood that I hold myself at liberty to vary and change the same as may be desired. When the machine is to be transported and used in the open field it is mounted upon supporting rollers or wheels B and B^1 which are arranged in pairs at the front and rear ends thereof, respectively. The front rollers or wheels B are provided with smooth or plain peripheries and travel on the smooth surface of a board or other suitable track B^3 that is placed on the ground or other place; and the rollers B^1 are provided with teeth on their peripheries as clearly shown in the

[Matter enclosed between rules erased in copy.]

drawings, the said toothed wheels meshing with the racks *b* that are arranged at the sides of the board or track B^3 and rigidly affixed or secured thereto in any suitable manner. The toothed wheels mesh with the toothed surface of the track so that when they are rotated by the means which I will presently describe, the main frame and the various parts of the operating mechanisms will be drawn along and thus fed at the required or proper rate, and the wheels B with the smooth peripheries are arranged comparatively close together so that they will bear on the track between the racks or toothed surfaces at the sides of the latter, whereby the frame is rendered very steady in its movement.

The toothed supporting wheels are rigidly affixed in any suitable manner to a common shaft b^1 so as to rotate or turn therewith, and this shaft is journaled in suitable bearings on the main frame at the lower rear side thereof. One of the ends of this shaft b^1 is extended beyond the sides of the vertical main frame, and to this extended end is rigidly affixed a ratchet wheel b^2, with the teeth of which engages the pointed or free end of a pawl b^3 that is pivoted on and carried by a hand or operating lever B^4 which is provided with an eye or opening at one end through which the shaft is passed so that the lever is supported on the shaft and free to move thereon independently of the same. This ratchet mechanism is designed to be operated by hand to feed the frame and other parts of the mechanism along to any required distance; but I do not intend to *be* restrict myself to the peculiar construction and arrangement of the parts of the same as they can be varied without departing from the spirit of my invention.

467 The distance which the main frame can be moved can be easily and readily regulated or varied by the operator by causing the pawl of the hand lever to slip over two, three or more teeth of the ratchet wheel so that the mesh of the wire fabric or fence can be made of uniform size or varied as may be necessary according to the design of fabric selected, as will be very readily understood.

The main frame A carries a series of devices for twisting the wire into open space or loops, and for the sake of clearness and convenience in describing or referring to these devices hereinafter, I will term them as twisters. Any preferred or desired number of these twisting devices may be employed that may be deemed desirable or necessary; and in the accompanying drawings I have shown a series of seven and will confine my description of the operation of the machine to this number of these devices, but I would have it understood that I hold myself at liberty to vary and change the number thereof to adapt the machine to manufacturing wire fabric of any desired width or to constructing fences of varying or different heights.

In order to render the operation of my machine more clear and explicit I have lettered these twisters C, D, E, F, G, H, I. The twisters from C to I inclusive form the active twisters, and at the top and bottom I provide two inactive twisters I' I^2; and in describing the process of manufacturing the different classes or kinds of fabric I will describe the method or manner of threading the twisters and

also in which the fabric is formed. Each of these active twisters consists essentially of two oppositely movable sections J and K, and a stationary section L these terms being used for the purpose of distinguishing the parts of the twisters. In figure 7 of the drawings I have shown one of these active twisters with the parts detached from each other, and will now describe the said parts separately from each other. The oppositely movable sections J K of each of the active twisters are made precisely or substantially alike; and they each consist of a tie or connecting bar *j*, and two segmental heads

Sept. 27, '86. A [semicircular heads or disks]* j^1 which are formed integral with the tie-bar and at the ex-

" " " segmental heads tremities of the latter. These A [semicircular heads or disks]* of the movable sections of the twisters, are placed on opposite sides of the

468 stationary sections of the twisters, so that

" " " segmental heads the flat sides of the said A [semicircular heads or disks]* of the movable sections impinge or bear against the stationary section on their flat or straight sides and their outer curved edges from a complete circle, whereby the stationary and movable sections of the twisters are adapted to impinge upon each other and to revolve together so as to form the twist in the loop during the process of manufacturing the fabric.

As before stated each of the movable sections of each twister is cast or formed in a single piece of metal and the segmental heads

Sept. 27, '86. A [semicircular heads or disks]* j^1 of the twister sections are each provided with a transverse aperture or opening j^7 except one of the movable sections of the upper and lower twisters C I respectively for the free passage of the wire as more fully heads

" " " described presently; and said [disks]* A are further provided with radial or outwardly projecting arms or ribs *k*, which impinge or bear against the sliding frames to prevent longitudinal play of the same. These arms are also formed or cast with the twister sections, and they are arranged to pro-

" " " segmental heads ject beyond the periphery of the A [semicircular heads or disks]* and at or near the straight inner

[Insert "C," Sept. 27, '86]* side thereof, for the purpose described. A

The stationary or immovable section L of each twister consists of a tie or connecting bar *l*, and the flat heads or ends *l'* formed or cast in a single piece therewith at opposite extremities of the tie or connecting bar, the heads or ends of the tie-bar being made of the same thickness or width as

[* Words and figures enclosed in brackets erased in copy.]

Insert "D," Sept. 27, '86.

the bar itself so that the sides of the tie-bar and heads thereof are in line with each other. A The stationary section of each twister has a cylindrical shaft or bearing piece l^2 cast in a single piece therewith, and this shaft is arranged at the rear end of the section and projects outwardly beyond one of the heads thereof, as shown, the shaft and the heads of the tie-bar being provided with passages or openings l^3 which are in line with each other so that the warp wires of the fabric or fence can pass through the said openings very freely without hindrance or danger of becoming entangled with other parts of the apparatus. The inactive twisters I and I' are arranged at the upper and lower end- of the main frame and on opposite sides of the central sections of the active twisters; and said inactive twisters are merely filled in and carried by the sliding frames to coincide with the central sections of the active twisters C I but they do not affect the operation of the machine.

M and N designate the sliding frames which are arranged within the uprights a a of the main frame A, and on opposite sides of the twisters. These sliding frames each consist of two vertical pieces n which are connected by suitable transverse pieces to render the frame rigid and strong and which bear against the inner sides of the uprights a of the main frame. The upright a at the front of the main frame, and the uprights m of each of the s-iding frames are each provided with an opening or aperture a^3 and m^1 respectively; the opening a^3 of the main frame being cir-ular and the openings m' of the sliding frame are formed on the inner edges of the sliding frames and semicircular so that when the slidding frames coincide the said openings or recesses m' register to form a complete circle; and these openings a^3 in the front uprights a of the main frame are connected by vertical slots or passages a^4 and a space m^3 is left between the contiguous edges of the sliding frames for the stationary sections L, as will be very readily understood. The opening a^3 and m' of the main and sliding frames are adapted to register or coincide; and they are equal in diameter to the diameter of the circle formed by the semicircular heads or disks at the ends of the movable sections of the twisters. It will thus be seen that I provide one of the uprights of the main frame and both uprights of the sliding frames with a series of circular openings which are connected by intermediate spaces or slots; and that these openings and slots or spaces are arranged one above the other, in vertical lines.

The circular openings in the said main and sliding frames correspond in number with the number of twisters employed.

The twisters are arranged in series one above the other, and the stationary section of each of the twisters is fitted between contiguous edges of the sliding frames and located between the movable sections of the twisters which are thus disposed on opposite sides of the stationary section. The central stationary sections of all of the twisters are arranged in a vertical line, and they are fitted or so arranged that the heads at the extremities thereof are fitted in the straight slots or spaces M^2 intermediate of the semicir-

cular openings in the contiguous edges of the vertically sliding frames, the shaft of the stationary section of the twister being passed through and suitably journaled in the rear uprights a and a' of the main frame so that the stationary section of the twister is prevented from movement or play in a vertical line. The segmental heads

Sept. 28, '86. A [semicircular disk or disk]* at the extremities of the movable section of each twister is fitted so as to rotate very freely in the opening m' in the heads

" " " sliding frame; and the straight faces of the [disks]* of the movable sections, and the tie or connecting bars thereof are normally in contact with the head and tie bar respectively of the corresponding stationary or central section of the twister, whereby all three of the sections of each of the twisters are adapted to be rotated in vertical planes together or simultaneously for the purpose of forming the twist in one of the loops of the fabric, all of the said series of twisters being geared together to adapt them to be rotated at one operation in order to twist the wires in the series of loops simultaneously.

From the foregoing description taken in connection with the drawing it will be seen that the heads

Sept. 27, '86. [or disks]* of each section of each twister is fitted in the opening or recess in one of the sliding frames M or N, and when these frames are moved vertically these movable sections of the twisters are carried or moved with their respective frames so that they are caused to coincide or register with a stationary central section of a twister above or beneath the section from which the movable section started before the sliding frame was shifted; thus for instance when the sliding frame N is moved upwardly the sections K of the twisters E and F are carried with it and caused to register with the stationary sections of the twisters D E respectively, as will be very readily understood. The object of thus shifting or moving the sections J K of the twisters is to cause the wires that are fed therethrough to cross or incline in order to prepare the wires for the subsequent operation of twisting them,

471 which is accomplished by rotating the twisters one or more times as may be desired all as hereinafter more fully described.

The sliding frames M N and the movable sections of the twisters carried thereby are operated or shifted vertically in opposite directions by a single movement of a single hand lever O, that is, when the frame M is moved upwardly the frame N will be forced downwardly, and *vice versa*. This hand lever O is journaled or fitted near one end on a central pin or shaft o that is rigidly supported in the upper end of the main frame A, and the said lever is connected with the shifting or sliding frames by intermediate links o' which are pivotally connected with the lever and the frames, as is obvious.

Each of the shafts of the central section L of each twister is pro-

[* Words and figures enclosed in brackets erased in copy.]

vided with a spur-gear wheel p which is rigidly secured thereto so as to rotate therewith, and these gear wheels are all of the same diameter and have the same number and proportion of teeth, so that all of the twisters are rotated at the same rate of speed and describe a complete circle or revolution in the same space of time. The gear wheels mesh with each other so that all the twisters are rotated simultaneously; and these gear wheels are operated at one time by a single crank O^1 that is arranged at one side of the machine and is secured on a shaft p^1 which is journaled in suitable bearings affixed to the upright a^1 of the main frame, the said shaft having a small bevel-gear wheel or pinion q which meshes with a larger bevel-gear wheel q^1 on one of the shafts of one of the stationary sections of one twister. It will be seen that by rotating the crank the motion thereof will be communicated to the shaft of one of the twisters through the bevel-gear wheel and pinion; and as all of these shafts are geared together the twisters are rotated simultaneously.

The warp wires that compose the fabric are passed or threaded through the central section of the twisters, through the aligned openings therein; and the woof wires of the wire fabric or fence are passed through the transverse perforations or openings in the semicircular disk or head of the movable sections of the twisters.

The warp wires are wound or coiled in bundles as they leave the factory and they are unwound in rear of the machine and stretched for a suitable distance, say fifty rods, upon the posts in rear
472 of the machine and they serve as stays to aid in keeping the machine vertical the said warp wire being passed through suitable openings in the upright a^1, thence through the shaft of the central stationary section of the twister, then through the aligned openings therein, and out of the opposite side of the machine through the circular openings in the upright a at the front of the main frame. The woof wires are coiled upon spools or bobbins R that are loosely journaled in brackets r which are affixed very rigidly to the outside of the movable side sections of the twisters
Insert "I," Oct. 13, '86. A each of said movable sections of the twisters except the inactive sections I I′ and one of the movable sections of the twisters C I being provided with a spool or bobbin which is carried thereby and rotates therewith during the operation of twisting the wire b to form the loops. The wire from these spools or bobbins R are passed through the transverse opening in the head of the movable side sections of the twisters, and thence through the circular opening in the front upright a of the main frame.

One of the movable sections of the twisters C and I at the extreme upper and lower ends of the machine however, are not provided with the bobbins R for the woof wires because when the shifting frames M N are moved vertically one section of one twister C and the section of the twister I on the opposite side of the stationary central sections of all of the twisters, will be thrown above and beneath the circular openings in the main frame and hence it is impossible to pass or feed the woof wires through the said movable section of the twisters therein, and when the frames M N are shifted to one

position as in figures 8 the inactive sections I I′ are adjusted to register with the stationary sections L of twisters C I, the inactive twisters being provided merely to properly rotate the twisters C I. The warp wires however are passed through the central stationary sections of the said twisters.

In order to attain a clear understanding of the shifting of the movable side sections J K of the active twisters by the sliding frames M N, I shall designate the central stationary sections by the reference letters which distinguish the twisters from each other, as for instance C D E, etc.; and the movable side sections of the twisters by the numerals from one to twelve inclusive, as clearly shown in the end elevations.

473 To make the style of fence shown in figures 1 and 21 of the drawing, I proceed to thread the twisters as follows:—The end twisters C I are threaded with the large wire which is to form the warp by passing it through the aligned openings in the central stationary part or section thereof; and the smaller-sized wires that form the woof of the fabric are then passed through the twister heads 1, 4, 5, 8, 9 and 12; and it will thus be seen that no wires are passed through the twister heads 2, 3, 6, 7, 10, and 11 and the inactive twisters I I′ and the blank sections of twiste-s C I. When using the machine to construct a fence in the field, one end of the large wires from the central section of stretchers located any desired distance from or in rear of the machine —. The large wires 15 which pass through the central sections of the upper and lower twisters C I form the warp for the woven-wire netting or fabric, while the smaller wires 16 which are inserted through the heads of the side movable sections of the twisters form the weft or woof of the netting. The wires 15 should be stretched taut by means of suitable stretchers located any desired distance from or in rear of the machine; but I have not deemed it necessary that these stretchers shall be shown as any device for accomplishing this end can be used. With the warp wires 15 arranged as shown and described to form the selvedge of the wire netting or fabric, and the weft or woof wires arranged through the twister heads of the sections J K to make the style of fence in figures 1 and 21 I proceed as follows.—The lever O is pressed down to move the slide M downward, and by the same movement force the sliding frame N upward inasmuch as the slides move in opposite directions simultaneously. By moving the sliding frame N upward the side sections of the twisters that are located in the sliding frames, are forced upward correspondingly; and the side sections J of the twisters in the sliding frame M are forced downward with the frame by the same movement of the lever. Thus the section 1 of the upper twister C which has one of the weft wires 16 will be carried down and brought on a line to coincide with the central section of the twister D. By the same vertical movement of the sliding frames M N, the twister heads 5 and 9 are carried down opposite to the central section I of the twisters F and H; and the twister heads 4, 8 and 12 are carried up op-

474 posite to the central sections of the twisters D F and H, one twister receiving one of the side sections from the adjoining

twister and giving one of its own side sections to the said adjoining section. See figures 8 and 9, and compare the same with figures 12 and 2. The blank inactive twisters I I′ are thus caused to register with the central section L of twisters C I, and the blank sections of twisters C I are reversed, as is obvious. In this manner the side sections J K which have weft wires 16 passed through them coincide with the twisters D E and which originally has its side sections without any weft wires. While the machine is in this condition with its weft wires all located at the twisters D F H the crank O′ is turned, causing the rotating of all of the twisters simultaneously as they are geared together for instantaneous operation. The number of complete turns given to the twisters will regulate the number of twists which are made in the wires. As the twisters are geared together, one twister will turn in one direction and the adjacent twister will turn in the opposite or reverse direction, but at the same time each twister will make the proper twist on the two weft wires without interfering with each other.

It will be understood that the throw or movement of the sliding frames M N is just sufficient to cause the side sections to align or coincide with the central section of the twisters above and beneath the same, according to the direction which the side sections are moved by the sliding frames. In turning the twisters, to make a complete twist it is necessary to completely revolve the twisters, that is transfer one side section from the sliding frame M to the sliding frame M and then return it again to the frame M. This turning of the twisters is kept up to correspond with the number of twists to be made at the crossing of the wires. When the twisting is completed at this point, the sliding frames are shifted back to their original positions by properly manipulating the hand lever, thus returning the side sections J K to their proper central sections. The weft wires are now located as follows:—The single weft wires at the twisters 1 and 12 extend alongside of the warp wires 15. The double weft wires at the twisters 4–5 and 8–9 are arranged on each side of their respe-tive central sections C E; and while in this position the crank is again turned to cause the rotation of the twisters and consequent twisting of the wires at the points designated. The single end weft wires twist around the warp wires, and the double weft wires twist upon themselves or around each other. Having now reached the point from where the operation started, it is not necessary to continue further, since by repeating the operation over and over again, the wires are inclined and twisted to form additional meshes or loops of the netting, as will be very readily understood. It will be plain that by the alternate shifting of the sliding frames M N up and down, the weft wires are extended down and up in alternate series and thus woven together to form the mesh when the twisters are rotated.

I illustrate another style of fence in figure 11, and I will proceed to describe the manner of weaving the wires. In this form of fence, I use the warp wires at each of the several central sections of the

twisters, and pass the woof wires through the side twister- A [heads 1. The manner of threading the]* twisters is shown in figure 10, and it differs from figure 2 only in having the warp wires through all of central and through the side twister section heads as in figures 1 and 2, *i. e.*, through numbers [1, 4, 5, 8, 9, and 12.]* It will be understood that the weft wires in the style shown in figure 11 twist around the warp wires which are held straight and tight.

Insert "E," Sept. 27, '86.

" " "

2, 3, 6, 7, 10 and 11.

Referring to figure 12 will be seen the arrangement of the wires when constructing the style of fence A [above described. Two]* Warp wires are used at the top and bottom twisters, and the weft wires are passed through both side sections of all the twisters, except the top and bottom ones, which latter have only one weft wire. By operating the slides M N of the machine, the adjacent weft wires are caused to cross each other, but not twist, at the points z^2, the twisting being made at the point on the weft wires reached when the slides come to the limit of their movements, as before explained. The weft wires cross at the point z^2 when about half of the movement of the slide has been made.

shown in Fig. 11.

Sept. 27, '86.

476 Referring to figure 15 will be seen another style of fence which is, however, very similar to the plan shown in figure 13. The threading of the wires in the twisters to form the plan of fence seen in figure 15, is shown in figure 14. The arrangement of the weft wires is the same as in figure 13, but the plan of the warp wires is different in the fact that in figure 14, all of the twisters have the warp wires. It will be seen, that the weft wires cross each other at an intermediate point before twisting around the warp wires, just as in figure 13. At the end of each movement of the slides, the twisters are rotated to effect the twisting of all the weft wires around the warp wires. The plan of fencing shown in figure 15 makes a very strong fence, the meshes being close together and the arrangement and connection of the warp and weft threads mutually bracing each other and thus avoid any liability to sag.

The style of fence shown in figure 16 is made by threading the central sections of the twisters at the upper and lower side of the machine, C I, with large wire 15, then the central section of the twisters D, E, F, G, H, with either large or small wire 16, and finally A [the twisters 1, 3, 5, 7, 9, and 11 with small wire from the]* bobbins R. The sliding frames are now shifted, and the twisters are rotated, after which the frames are returned to their former position, the same as in the operations hereinbefore referred to.

Insert "F," Sept. 27, '86.

To make the style of fence shown in figure 17 of the drawings, the central section L of the twisters C, E and I are threaded with the large warp wires 15, and the heads 1, 4, 5, 6, 7, 8, 9, 10, 11, 12, of the

[* Words and figures enclosed in brackets erased in copy.]

side sections J K are threaded with the small weft wire 16 from the spools, R after which the sliding frames are shifted, the twisters rotated, and the frames returned to their normal position, as hereinbefore described.

The mesh of the fabric shown in this figure is very wide at the top or upper half and at the lower half it is very close to prevent small animals from passing through the lower part as may be desired in some cases, and also producing a very ornamental and pretty fence.

Figure 18 shows another plan of fencing made by my machine, in which I employ pickets or slats as shown.

477 The threading of the twisters to make this form of netting shown in this figure and the operation is exactly the same as is represented in figures 12 and 13. The palings or pickets are introduced by hand through the meshes of the wires as each mesh is completed.

Figure 19 illustrates the common form of wood fence held together by wires. In this instance as many of the twisters are threaded with their side sections as will accord with the desired number of strands for the fence, but the central sections L have no wires passed through the opening at the front end thereof. It will be seen that the central and side sections of the twisters have slots or openings. The wires for the side sections in this instance are passed through the central shaft or spindle of the central section, then they are separated and one wire is passed through one side section and the other wire through the other side section. In this instance warp or larger wires only are used from the rolls or bundles in rear of the machine, and no woof wires are fed from the spools R on the movable sections of the twisters. In making this style, the sliding frames M N remain inactive. The twisters are rotated in first one direction and then the other to twist or weave the wires between the slats or pickets in a straight line, the pickets being introduced by hand, of course. In figure 20 I have shown still another form of fence that my machine is capable of making. In threading the machine for this style, each alternate central twister is threaded, C, E, G, and I, with the warp or large wires, and the heads 1, 2, 3, 4, 5, 8, 9, 10, 11 and 12 are threaded with the small or woof wire, after which the slides and levers are operated in the manner hereinbefore described to form the twists and meshes of the fabric.

It will be observed that I provide a simple and strong machine which is capable of doing a variety of work without adjusting or changing any of its parts. The machine has very few parts when the character of the work to be performed thereby is taken into consideration; and the arrangement of the parts is such as to avoid the possibility of the machine getting out of working order.

478 I may either construct a portable machine as shown in the accompanying drawings to work in the open field or other place, or dispose the parts in a horizontal instead of a vertical position and mount the same on suitable bearings and legs to provide a stationary machine for indoor use.

Erased Sept. 27, '86.

I am aware that machines for making wire netting to form a fence are not new, as such machines have been previously patented by Sedgwick on August 5, 1879; Davidson on December 4, 1883; and Combs on January 6, 1885.

The Combs patent so far as I am aware describes and shows a fence-making machine which employs divided or sectional gears which are actuated by sliding racks. The divided gears in this machine are not capable of sliding or shifting motion to adapt one section of one gear to coincides or register with the other section of the adjacent gear; and the machine is not adapted to perform the variety of work which can be accomplished by my improved apparatus. He cannot change the style or width of the mesh of the fabric by his arrangement and construction of twisters, which can be easily accomplished by my apparatus. The divided gears that form the twisters are on the bobbins; and additional means are required to make the selvedge or warp, whereas in my machine I utilize the central section for this purpose.

I do not wish to be understood as confining myself to the exact details of construction and form and proportion of parts herein shown and described as an embodiment of my invention, as I am aware that numerous changes therein can be made without departing from the spirit or sacrificing the advantages of my invention.

Having thus fully described my invention what I claim as new and desire to secure by letters patent of the United States is:—

Substitute "G," Sept. 27, '86.

1. In a wire-fabric machine, a series of sectional twisters geared directly together, substantially as described, for the purpose set forth.

2. In a wire-fabric machine, the combination of a series of sectional twisters capable of sliding movement with relation to each other and geared for simultaneous rotation, substantially as described, for the purpose set forth.

Substitute "L," Nov. 11, '86.

479 1 [3].* In a wire-fabric machine, the series of sectional twisters comprising the central hub section and the two side sections dis-

[Matter enclosed between rules erased in copy.]
[* Words and figures enclosed in brackets erased in copy.]

posed on opposite sides of the central section, the hub section being stationary while the side sections are capable of shifting movement, substantially as described, for the purpose set forth.

2 [4].* In a wire-fabric machine, the series of sectional twisters, each of which comprises a longitudinally immovable section and two sections which have longitudinal movement, substantially as described, for the purpose set forth.

3 [5].* In a wire-fabric machine, the series of sectional twisters, each of which comprises the central portion (for) A carrying the warp wires and the shifting side sections [which carry]* (for carrying) A the weft wires, substantially as described.

" " "

" " "

2 [4 6].* In a wire-fabric machine, the combination of a series of sectional twisters geared together for simultaneous rotation, and each comprising a central portion movable only on its axis and side portions capable of a compound movement, that of rotation on A (this axes) [its axis]* and of a shifting longitudinal movement, substantially as described, for the purpose set forth.

Sept. 27, '86.

Substitute "M," Nov. 11, '86.

5 [7].* In a wire-fabric machine, the combination of a series of sectional twisters, comprising the stationary central portion capable of rotation on its axis only, and the side sections having a longitudinal movement, and means for shifting the said side sections to cause one section of one twister to coincide with the central section of the adjacent twister, substantially as described, for the purpose specified.

4 [6 8].* In a wire-fabric machine, the combination with the series of sectional twisters, of the shifting frames carrying the movable sections of the twisters, the central section of the A (twisters) [latter]* being held from longitudinal movement, during the

Nov. 11, '86.

[Matter enclosed between rules erased in copy.]
[* Words and figures enclosed in brackets erased in copy.]

Insert "N," Nov. 11, '86.

shifting of the frames and the side sections being A carried [thereby,]* by the frames A A substantially as described, for the purpose set forth. Nov. 11, '86.

5 [7 9].* In a wire-fabric machine, the combination with the sectional twisters comprising the central sections capable of rotating movement on A [its axis]* their axes only and the side sections and rotate by the central sections having longitudinal movement, A of the shifting frames carrying the said side sections which are capable of free rotation therein, substantially as described, for the purpose set forth. " " " 480

Erased Nov. 11, '86.

8 [10].* In a wire-fabric machine, the sectional twisters comprising the central portion or section and the side sections disposed on opposite sides of the central section and movable with respect to each other, substantially as described.

6 [9 11].* In a wire-fabric machine, the combination of the sectional twisters comprising the central section having the projecting heads and the side sections fitted against the central section, and the sliding frames in which the side sections are carried and A capable of free [rotation A therein,]* rotation substantially as described, for the purpose set forth. Sept. 27, '86. Oct. 13, '86.

Erased Nov. 11, '86.

10 [12].* In a wire-fabric machine, the sectional twisters comprising the central section and the two side sections, in combination with the simultaneously sliding frames movable in opposite directions and car-ying the side sections of the twisters, substantially as described, for the purpose set forth.

7 [11 13].* In a wire-fabric machine, the sectional twisters comprising the central and side sections movable with respect to each other, and the sliding frames movable in opposite directions and carrying the side sections therewith simultaneously, A and means for shifting the said frames, substantially as described, for the purpose set forth. " " "

[Matter enclosed between rules erased in copy.]
[* Words and figures enclosed in brackets erased in copy.]

8 [12 14].* In a wire-fabric machine the sectional twisters comprising the central and side sections, in combination with the sliding frames having the recesses in which the side sections of the twisters are fitted, and a lever connected with the slides for moving them in opposite directions simultaneously, substantially as described.

9 [13 15].* In a wire-fabric machine, the series of sectional twisters comprising the central and side sections the central section of each twister being geared to the twister adjacent thereto for simultaneous operation, [and means for rotating one of the twisters,]* substantially as described, for the purpose set forth.

" " " 481

10 [14 16].* In a wire-fabric machine, the combination of a series of twisters geared directly together for simultaneous operation and each comprising a central section and the side section, each side section carrying a spool or reel for the wire, substantially as described, for the purpose set forth.

11 [15 17].* In a wire-fabric machine, a series of twisters connected for simultaneous operation and each consisting of a central section and the side section, in combination with the spools carried by the side sections, substantially as described.

Insert "O," Nov. 11, '86.

12 [16 18].* In a wire-fabric machine, the combination of a carrying frame, the sliding frames therein, the sectional twisters having the stationary central section and the side sections fitted in the sliding frames, and means for moving the carrying frame with a step-by-step motion, substantially as described, for the purpose set forth.

Erased Sept. 27, '86.

19. In a wire-fabric machine, the combination of a track, a carrying frame geared to the track and having the twisting devices and the reels, and pawl and ratchet mechanism for feeding the frame and its devices, substantially as described, for the purpose set forth.

13 [17 19 20].* The combination of a series of twisters geared directly together and each consisting of a central section capable of rotation on its axis only, and the side sections, the oppositely movable slides in which the side sections are fitted, the spools carried by the side sections, and a lever for shifting the slides simultaneously, substantially as described.

14 [18 20 21].* The combination of a series of sectional twisters each consisting of central section having the projecting heads, and

[Matter enclosed between rules erased in copy.]
[* Words and figures enclosed in brackets erased in copy.]

the side sections in contact with the central sec-
Sept. 27, '86. tion and having the A segmental [semicircular]* heads with their flat sides in contact with the heads of the central sections, the said heads of the central and side sections forming a complete circle when the sections are placed together side by side, substantially as described, for the purpose set forth. A

Insert "H," Sept. 27, '86.

482 In testimany that I claim the foregoing as my own, I have hereto affixed by signature, in presence of two witnesses.

ALVA L. KITSELMAN.

Witnesses:

JAMES W. McCAMISH.
HENRY T. KITSELMAN.

III.—*Oath.*

STATE OF INDIANA, *County of Randolph,* } ss:

Alva L. Kitselman, the above-named petitioner, a citizen of the United States, resident of Ridgeville, in the county of Randolph and in the State of Indiana being duly sworn, deposes and says that he verily believes himself to be the original, first and sole inventor of the improvement in wire-fabric machines, described and claimed in the foregoing specification; that the same has not been patented to him or to others with his knowledge or consent, in any country, that the same has not to his knowledge been in use or on sale in the United States for more than two years prior to this application; and he does not know and does not believe that the same was ever known or used prior to —.

ALVA L. KITSELMAN.

Sworn to and subscribed before me this 2d day of August, 1886.

S. R. ALLEN,
[NOTARIAL SEAL.] *Notary Public.*

(Endorsed:) Serial No. 210,818. Paper No. 1. Application. Filed Aug. 13, 1886. U. S. Patent Office Aug. 13 1886.

[* Words and figures enclosed in brackets erased in copy.]

483 Room No. 209.

All communications should be addressed to "The Commissioner of Patents, Washington, D. C."

Any communication respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., *Sept.* 14, 1886.
Mailed " 17, "

Subject: Wire-fabric machine. Filed Aug. 13, 1886. No. 210,818.

A. L. Kitselman, care C. A. Snow & Co., present:

Please find below a communication from the examiner in charge of the application above noted.

M. V. MONTGOMERY,
Commissioner of Patents.

The portions of the central vertical section L which project beyond the heads 11 should be lettered and described. In Fig. 7, and in other views also, on the inside of the heads *j*[1] is shown a cross-bar having a rounded notch in its end. This should be lettered and its purpose stated.

Throughout the specification it is noticed that corrections and insertions have been made in pencil, by the attorneys it is presumed. As these penciled corrections add materially to the clearness of the description they should be inserted by amendment in the regular way.

A brief description of Fig. 21 should be given.

In line 19 page 7 and elsewhere in the description and claims, the heads *j* are described as semicircular. The term is incorrect. They are not semicircular but are segmental and should be so termed. The term disk as applied to these heads is not strictly correct.

In line 2 page 19 "figure 13" should be "figure 12." The words "above described" line 3 are incorrect. The words "so far as I am aware" line 6 page 22 should be erased as meaningless in view of the erasure of the words "the only" in the next line. It is not seen that the acknowledgement of the state of the art in lines 2 to 12 page 22 is necessary. If retained in the case the most recent state
484 of the art should be acknowledged. See the subclass of wire working, fabrics, making.

When the formal questions are settled claims one and two will each be rejected on 327924 Oct. 6, '85 to Dennis; 341230 May 4, '86 to Gilbert, both in fabrics, making, and Eng. patent 2317 of 1885. In claim five "carrying" and "which carry" should each be changed to "for carrying" in order that the wires may not appear to be an element of the claim. Slight verbal errors are noticed in claims six, nine, thirteen, fifteen and twenty. In claim eleven "are" should be inserted before "capable" line 5 and "therein" line 6 should be cancelled. Claim nineteen will be rejected on 298368

May 13, '84 to Fultz and 322872 July 21, '85 to Watson, wiring wood fences.

S. W. STOCKING, *Ex'r.*

A. P. GREELY, 1*st* —.

(Endorsed:) Serial No. 210818. Paper No 1. Letter. Dated Sept. 14 1886.

In re application Alva L. Kitselman. Wire-fabric machine. No. 210,818. Filed August 13, 1886.

Hon. Commissioner of Patents.

SIR: We desire to amend the above-entitled application as follows:—

After "figure 4" on line 7 of page 3 insert:—"looking in the direction of the arrow 1."

Erase lines 9, 10, 11 and 12 of page 3, and insert—

"A," Sept. 27, '86. "to figure 5 on the line *z z* of figure 4, looking in the direction of the arrow 2."

After line 11 of page 4 insert:—

"B." "Fig. 21 is an elevation of the style of fence made when the machine is threaded as shown in Fig. 2."

485 *Erase the words "semicircular heads or disks" and substitute therefor the words "segmental heads," on lines 1, 19, 21 and 24 of page 7, lines 5 and 12 of page 8, line 13 of page 11.*

Erase "disks" on line 8 of page 8 and 16 of page 11 and insert "heads"

After line 14 of page 8 insert—

Erased Oct. 13, '86. [C.]*

"The segmental heads of the movable section of the twisters are each provided with an integral cross-bar J^3 on its inner side and this bar is provided with a notch at its middle, as clearly shown in Fig. 7."

After "other" on line 22 of page 8 insert

"D." "D." "The extremities of the heads I^1 of the central stationary section of each twister, are extended beyond the upper and lower sides of the tie or connecting bar, as at I^4 so that when the said central section is rotated with the side sections of the twister to form the twist in the loop, the extended ends I^4 will impinge upon the inner sides of the main carrying frame and thereby prevent the central section from longitudinal movement."

[Matter enclosed between rules erased in copy.]
[* Words and figures enclosed in brackets erased in copy.]

Erase "or disks" on line 29 page 11.
Erase line 23 of page 18 and insert—

"E." "heads 2, 3, 6, 7, 10 and 11 as shown in Fig. 10, or they may be passed through the heads 1, 4, 5, 8, 9 and 12, which will produce the same result. The manner of threading the"

Erase the numerals 1, 4, 5, 8, 9 and 12, on lines 27 and 28 of page 18 and insert "2, 3, 6, 7, 10, and 11."
Erase "above described. Two" on lines 3 and 4 of page 19, and insert—"shown in Fig. 13."
Erase line 7 of page 20 and insert

"F." "the twister heads 2, 4, 6, 8, 10, and 12 (as shown in Fig. 16), with small wire from the"

Erase lines 2 to 21 inclusive of page 22.
Erase claims 1 and 2 and insert:—

Erased Oct. 13, '86.
["G."]*

1. In a wire-fabric machine, a series of rotary twisters geared directly together for simultaneous rotation and each having two sections which are capable of a sliding movement, substantially as described, for the purpose set forth.
486
2. In a wire-fabric machine, the combination of a series of rotary twisters geared directly together, substantially as described, for the purpose set forth.

Claim 5 line 3 insert "for" before "carrying" and on line 4 erase "which carry" and insert "for carrying."
Claim 6, line 5 and claim 9 line 3, erase "its axis" and insert "their axes"
Claim 11 insert "are" before "capable" on line 5, and on line 6 erase "rotation"
Erase claim 19.
Claim 21, line 4 erase "semicircular" and insert "segmental"
Insert the following claims:—

"H." 15 [19 21].* In a wire-fabric machine, the combination of a series of rotary twisters geared directly together for simultaneous operation, each twister having a central section capable of rotary movement only, and two side sections which are capable of a shifting movement independently of the central section, in opposite directions whereby simultaneously A [and thereby adapt]* the said shifting sections of one
Oct. 13, '86.

[Matter enclosed between rules erased in copy.]
[* Words and figures enclosed in brackets erased in copy.]

are adjusted
Oct. 13, '86. twister A to register with the central sections of twisters on opposite sides of the same, substantially as described, for the purpose set forth.

16 [20 22].* In a wire-fabric machine, the combination of a series of rotary twisters geared together for simultaneous operation, each twister comprising a central section capable of rotation on its axis only, and the shifting sections arranged on opposite sides of the central section, each side section having segmental heads which impinge upon the central section when the twister is rotated, substantially as described, for the purpose set forth.

17 [21 23].* In a wire-fabric machine, the combination of a series of rotary twisters, each of which consists of two shifting sections capable of movement in opposite directions simultaneously and a
having rotary movement imparted thereto and
Nov. 11, '86. 487 central section A interposed be-
to impinge
" " " tween the shifting sections A [and impinging]* upon the latter when
and
" " " they align therewith [to]* A rotate the same, substantially as described.

"H." 18 [22, 24].* In a wire-fabric machine, the combination of a series of rotary twisters, each of which consists of a central section held from endwise movement and capable of rotation on its axis only, and the side sections capable of shifting movement in opposite directions simultaneously, the side sections of one twister being arranged on opposite sides of the central section thereof and impinging upon the latter to be rotated on their axes therewith, the twisters being capable of rotary movement only when the shifting side sections thereof are in line with the central section, substantially as described, for the purpose set forth.

19 [23, 25].* In a wire-fabric machine, the combination of a series of rotary twisters, each twister comprising the shifting side sections provided with the segmental heads through which the warp wires are to be passed, and the central section disposed between the side sections and held from shifting movement, the central sections of the series of twisters being geared directly together
Insert ["K," Oct. 13, '86].* and impinging upon the side sections when the latter are in line therewith, to rotate the said side sections, substantially as described, for the purpose set forth. A
"Q," Nov. 11, '86.

The references cited do not disclose the series of *rotary* sectional twisters *geared directly together* for simultaneous operation, to which our claims are now limited and favorable action is solicited.

[* Words and figures enclosed in brackets erased in copy.]

The specification has been corrected throughout, and it is believed that no further objection thereto will be made.

Respectfully submitted,

ALVA L. KITSELMAN,
By C. A. SNOW & CO., *Attorneys.*

(Endorsed:) Serial No. 210818. Paper No. 2. Amendment. Filed Sept. 27, 1886. "A," "B," "D," "E," "F" "G," "H." U. S. Patent Office Sep. 27 1886. Division XIV.

488 Room No. 209.

All communications should be addressed to "The Commissioner of Patents, Washington, D. C."

Any communication respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., *Sept.* 30, 1886.
Mailed Oct. 2, "

Subject: Wire-fabric machine. Filed Aug. 13, '86. No. 210,818.

A. L. Kitselman, care C. A. Snow & Co., present:

Please find below a communication from the examiner in charge of the application above noted.

M. V. MONTGOMERY,
Commissioner of Patents.

The purpose of the notches described and shown in the ends of j^3 should be stated. The manner of securing the spools to the side sections should be stated.

Claim 11 as amended is unintelligible. The word "rotation" cancelled from line 6 by the last amendment should be restored and the word "therein" in the same line should be cancelled. Claim 21 is unintelligible in line 7. The applicant should distinguish between the elements claimed and the function stated in the claim.

When the application is in proper form claims 1 and 2 will be rejected on 10743 Apr. 4, '54 to Nesmith, fabrics, making.

S. W. STOCKING, *Ex'r.*

A. P. GREELEY, 1*st.*

(Endorsed:) Serial No. 210818. Paper No. 3. Letter. Dated Sept. 30, 1886.

489 *In re* application Alva L. Kitselman. Wire-fabric machines. No. 210,818. Filed August 13, 1886.

Hon. Commissioner of Patents.

SIR: We desire to amend the above-entitled application as follows:

√ *Cancel amendment C filed Sept. 27, 1886.*

With reference to the notched cross-bar on the heads of the seg-

mental heads of the twisters, we have to state that we have communicated with the applicant and he advises us that the said cross-bars have no use or function in the operation of the machine. In experimenting with the machine he at first included these bars in the model, and afterwards found that they were of no utility. The model contained the bars, and through an error of the draftsman were included in the drawings. We do not think that any further objection will be made to this feature of the case.

After "twisters" on line 9 of page 14, insert

"J," Oct. 13, '86. "by means of suitable bolts or screws which are passed through the brackets and the tie-bar of the movable section."

Claim 11, line 6, erase "therein" and insert "rotation."

Claim 21, lines 6 and 7 erase "and thereby adapt" and substitute therefor "whereby;" line 8 before "to" insert "are adjusted"

Erase claims 1 and 2 and change ordinals of remaining claims.

Add the following claims:

"K." Oct. 21, '86.

20 [24].* In a wire-fabric machine, the combination of a series of rotary twisters geared directly together and each having shifting sections for carrying the wire, [and]* movable in opposite directions simultaneously, substantially as described for the purpose set forth.

Substitute "Q," Nov. 11, '86.

21 [25].* In a wire-fabric machine, the combination of a series of rotary twisters geared directly together and each having two shifting sections which are capable of movement in opposite directions simultaneously and carrying fixed spools upon which the warp wires are wound, substantially as described, for the purpose set forth.

490 The new reference cited does not show the oppositely movable shifting sections adapted to carry the warp wires, but employs independent slides to effect the crossing of the wires. In our case the shifting sections carry or support the wires.

It is believed that no further objection will be made to the allowance of the case, in view of the foregoing amendments.

Respectfully submitted,

A. L. KITSELMAN,
By C. A. SNOW & CO., *Attorneys.*

(Endorsed:) Serial No. 210818. Paper No. 4. Amendment. Filed Oct. 13, 1886. "J." "K." U. S. Patent Office. Oct. 13 1886. Division XIV.

[Matter enclosed between rules erased in copy.]
[* Words and figures enclosed in brackets erased in copy.]

Room No. 209.

All communications should be addressed to "The Commissioner of Patents, Washington, D. C."

Any communication respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., *Oct.* 15, 1886.
Mailed " 16, "

Subject: Wire-fabric machine. Filed Aug. 13, '86. No. 210,818.

A. L. Kitselman, care C. A. Snow & Co., present:

Please find below a communication from the examiner in charge of the application above noted.

M. V. MONTGOMERY,
Commissioner of Patents.

The word "and" line 3 of claim twenty-four should be cancelled as obscuring the meaning of the claim.

Claims twenty-four and twenty-five are each rejected on 491 Nesmith cited and on 310,254 Jan. 6, '85 to Combs, fabrics, making. There is no invention broadly in gearing the twisters of Combs' machine directly together, twisters so geared being old as shown by Nesmith.

A. P. GREELEY,
Acting Ex'r.

(Endorsed:) Serial No. 210818. Paper No. 5. Rejection. Dated Oct. 15 1886.

In re application Alva L. Kitselman. Wire-fabric machines. No. 210,818. Filed August 13, 1886.

Hon. Commissioner of Patents.

SIR: We desire to amend by erasing the word "*and*" in line *3* of claim *24*.

Reconsideration on claims *24* and *25* is asked.

It is true the Coombs machine shows a series of sliding twisters, but if they *were* geared directly together for simultaneous rotation, as in our case, *it would be impossible to slide the twisters*. The Nesmith machine employs the geared rotary twisters but does not employ the shifting sections, it being necessary in this case to employ complicated mechanism for crossing the wires preparatory to twisting them together.

How can the examiner combine these references and meet the claim presented?

This inventor has devised certain novel devices which are arranged in a peculiar manner to adapt the shifting sections to all be rotated simultaneously, by gearing them together, so that their sliding movement is not interfered with by their rotary motion.

492 This feature appears to be new with this applicant, and the references cannot be fairly held to anticipate the same.

Careful reconsideration is asked.

Respectfully submitted,

A. L. KITSELMAN,
By C. A. SNOW & CO., *Att'ys.*

(Endorsed:) Serial No. 210818. Paper No. 6. Amendment. Filed Oct. 21 1886. 209. U. S. Patent Office. Oct. 21, 1886. Division XIV.

Room No. 209.

All communications should be addressed to "The Commissioner of Patents, Washington, D. C."

Any communication respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., *Oct.* 29, 1886.
Mailed " 30, "

Subject: Wire-fabric machine. Filed Aug. 13, '86. No. 210,818.

A. L. Kitselman, care C. A. Snow & Co., present:

Please find below a communication from the examiner in charge of the application above noted.

M. V. MONTGOMERY,
Commissioner of Patents.

Claims twenty-four and twenty-five must remain under rejection on the references and reasons before given.

Further search discloses the following reference English patent A. D. 1876 No. 2516, on which claims one, two, three, five, six, seven, eight, ten, eleven, and twenty-one are each rejected.

A. P. GREELEY,
Acting Ex'r.

(Endorsed) Serial No. 210,818. Paper No. 7. Rejection. Dated Oct. 29, 1886.

493 *In re* appl. Alva L. Kitselman. Wire-fabric machines. Filed Aug. 13, 1886. No. 210,818.

Hon. Commissioner of Patents.

SIR: We desire to amend the above-entitled application as follows:

Erase claims 1, 2, and 3 and insert:—

"L," Nov. 11, '86. 1. In a wire-fabric machine, a series of sectional twisters, each of which comprises central section for carrying a warp wire and having rotary movement imparted thereto, and the shifting sections for carrying the weft wire and receiv-

ing rotary motion from the central section to form the twist, substantially as and for the purpose herein described.

Erase claim 5 and insert:—

"M." 3. In a wire-fabric machine, the combination of a series of sectional twisters, comprising the central section having rotary movement imparted thereto to rotate the same on its axis, the shifting side sections adapted to align with the central sections to be rotated thereby, and mechanism for shifting the said side sections to cause the side section of one twister to coincide with the central section of the adjacent twister, substantially as described, for the purpose set forth.

Claim 6 line 6 insert being before "carried" and after "thereby" insert

"N." "to cross the wires the side sections being rotated by the central sections

Claim 7 line 4 after "movement" insert

"and rotated by the central sections"

Erase claims 8 and 10.

Claim 11 line 4 after "simultaneously" insert

"and carrying the side sections therewith"

494 *Claim 13 line 5 erase "and means for rotating one of the twisters."*

Claim 15 insert the following before "substantially"

"O." "the central section of each twister being provided with a longitudinal opening for the passage therethrough of the warp wire."

Claim 21 line 4 after "section" insert

"P." "having rotary movement imparted thereto and"; *line 5 erase "and impinging" and insert to impinge, line 6 erase "to" and substitute and*

Erase claims 24 and 25 and insert:—

"Q." 20. In a wire-fabric machine, a series of sectional twisters, each comprising a central section [which are]* the central sections being

Nov. 18, '86. A geared together to be simultaneously rotated on their axes, and the shifting side sections adapted to align with the central sections to be rotated therewith, substantially as described, for the purpose set forth.

[* Words and figures enclosed in brackets erased in copy.]

Reconsideration on the case as herewith amended is requested.

The reference cited—English patent No. 2516 of '76—states that "when the division- of the wheels are carried apart by the ordinary sliding bars my wires are pushed by guides out of the spaces in the wheels into slots in one of the sliding bars" and again "or I divide the twisting wheels into three parts, my extra wire passing through the central division and the two side segments travel to and fro to form the twist, leaving the central division into position with my supplemental wire therein maintained"

In my invention, the side sections align with the central section to be rotated by and with the same and the central sections are all geared together for simultaneous rotation—a feature which is not disclosed in the reference—and the sliding frames are movable in opposite directions simultaneously and carry the side sections of the twisters with them to cause the side section of one twister to align with the central section of the adjacent twister. In view of these facts and the amendments to the claims, it is believed that no further objection will be made and the case allowed.

495 Claims 8 and 10 have been cancelled because their subject-matter is substantially set forth in the preceding claims.

Respectfully submitted.

ALVA L. KITSELMAN,
By C. A. SNOW & CO., *Att'ys.*

(Endorsed:) Serial No. 210,818. Paper No. 8. Amendment. Filed Nov. 11, 1886. "L." M." "N." "O." "P." "Q." 209. U.S. Patent Office Nov. 11 1886. Division XIV.

Room No. 209.

All communications should be addressed to "The Commissioner of Patents, Washington, D. C."

Any communication respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., *Nov.* 13, 1886.
Mailed " 15, "

Application for patent for wire-fabric machine. Filed Aug. 13, '86. No. 210,818.

A. L. Kitselman, care C. A. Snow & Co., present:

Please find below communication from the examiner in charge of the application above noted.

M. V. MONTGOMERY,
Commissioner of Patents.

Claim four as now amended is obscure in that it is not clear what is meant by "thereby" line 6. It is supposed that the frames are meant. If so the words "by the frames" should be substituted for "thereby." "Twisters" should be substituted for "latter" line 4 of

this claim for the sake of clearness. Claim twenty is obscure and should be amended by substituting "the central sections being" for "which are" line 4 of the claim.

With these amendments the case will be allowed.

S. W. STOCKING, *Ex'r.*

A. P. GREELEY, 1*st.*

(Endorsed:) Serial No. 210818. Paper No. 9. Letter. Dated Nov. 13, 1886.

496 *In re* application A. L. Kitselman. Wire-fabric machine. Filed Aug. 13, 1886. No. 210,818.

Hon. Commissioner of Patents.

SIR: We desire to amend the above-entitled application as follows:

Claim 4 erase "thereby" in line 6 and insert "by the frames;" line 4 erase "latter" and insert "twisters."

Claim 20 line 4 erase "which are" and insert "the central sections being."

It is believed that the case as now amended is in condition for allowance.

Respectfully submitted,

C. A. SNOW & CO., *Attorneys.*

(Endorsed:) Serial No. 210818. Paper No. 10. Amendment. Filed Nov. 18, 1886. 209. U. S. Patent Office. Nov. 18, 1886. Division XIV.

Issue division.

All communications should be addressed to "The Commissioner of Patents, Washington, D. C."

Serial No., 210,818.

DEPARTMENT OF THE INTERIOR,
U. S. PATENT OFFICE,
WASHINGTON, D. C., *Nov.* 23″, 1886.

Alva L. Kitselman, c/o C. A. Snow & Co., city.

SIR: Your application for a patent for an improvement in wire-fabric machines filed Aug. 13″, 1886, has been examined and allowed.

497 The final fee, twenty dollars, must be paid, and the letters patent bear date as of a day not later than six months from the time of this present notice of allowance.

If the final fee is not paid within that period the patent will be withheld, and your only relief will be by a renewal of the application, with additional fees, under the provisions of section 4897, Revised Statutes. The office aims to deliver patents upon the day of their date, and on which their term begins to run; but to do this properly applicants will be expected to pay their final fees at least twenty days prior to the conclusion of the six months allowed them by law. The printing, photolithographing, and engrossing of the

several patent parts, preparatory to final signing and sealing, will consume the intervening time, and such work will not be done until after payment of the necessary fees.

When you send the final fee you will also send, distinctly and plainly written, the name of the inventor and title of invention as above given, date of allowance (which is the date of this circular), date of filing, and, if assigned, the names of the assignees.

If you desire to have the patent issue to assignees, an assignment containing a request to that effect, together with the fee for recording the same, must be filed in this office on or before the date of payment of final fee.

Additional copies of specifications and drawings will be charged for at the following rates: Single copies, uncertified, 25 cents twenty copies or more, 10 cents each. The money should accompany the order.

Very respectfully, M. V. MONTGOMERY,
Commissioner of Patents.

☞ In remitting the final fee give the serial number at the head of this notice.

The within title is that given by the examiner in charge, as most appropriate to your invention. Should you desire a change in the same, satisfactory reasons must be given therefor on or before the payment of the final fee.

☞ If payment is made by check or draft, the credit allowed is subject to the collection of the same.

498 *Memorandum of Fee Paid at U. S. Patent Office.*

(Be careful to give correct serial No.)

Serial No. 210,818, 1886.

Inventor:
Alva L. Kitselman.

Patent to be issued to inventor and assignee:

——, ——.

Assignment filed today.

Name of invention, as allowed:
Wire-fabric machine.

Date of payment:
Dec. 27, 1886.

Fee:
$20.

Date of filing:
Aug. 13, 1886.

Date of circular of allowance:
Nov. 23, 1886.

The Commissioner of Patents will please apply the accompanying fee as indicated above.

C. A. SNOW & CO., *Attorneys.*

Send patent to Messrs. Kitselman Bros. Ridgeville, Randolph Co. Ind.

(Endorsed:) United States Patent Office, Dec. 27, 1885. Received.

499 (Serial No. 210,818.) 1886. Ex'r Book No. 76.

Div. 14.

Patent No. 356,322.

Alva L. Kitselman ass'or of ½ to Davis M. Kitselman of same place

Of Ridgeville

County of Randolph

State of Indiana

Invention: Wire-fabric machines.

Parts of application filed.

Petition	Aug. 13, 1886
Affidavit	" " "
Specification	" " "
Drawing 8 sheets	" " "
Model not req'd	
Specimen ——	
First fee cash, $15	Aug. 13 1886.
" " cert. ——	

App. filed complete Aug. 13, 1886.

Examined Nov. 19 '86 S. W. Stocking

Countersigned: J. W. Babson for Commissioner.

Nov. 23, '86.

3. Notice of allowance Nov. 23" 1886

Final fee cash $20, Dec. 27 1886.

" " cert. ——, 188–.

Patented Jan. 18 1887.

Att'y or P. O. address C. A. Snow & Co. present.

500 1886.

Contents.

½. Application 1 paper[s].*
1. Letter Sept. 14 '86.
2. Ame-d't A. H. Sept. 27 '86.
3. Letter Sept. 30 '86.
4. Am'd't "I. K." Oct. 13 '86.
5. Rej. Oct. 15 '86.
6. Amendment Oct. 21 '86.
7. Rej. Oct. 29 '86
8. Am'd't "L. Q" Nov. 11, 1886.
9. Letter Nov. 13 '86
10. Amendment Nov. 18 '86.
11.
12.

[* Words and figures enclosed in brackets erased in copy.]

13.
14.
15. Wire-working
16. Fabrics making.
17.
18.
19.
20.

Title: Improvement in wire-fabric machines.

Endorsed: U. S. Patent Office. Copy made April 8, 1898. 46,600/98.

501 DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE.

To all persons to whom these presents shall come, Greeting:

This is to certify that the annexed is a true copy from the records of this office of the file-wrapper and contents in the matter of the letters patent granted John C. Pope, assignor to Alva L. Kitselman and Davis M. Kitselman, September 26, 1893, number 505,607, for improvement in wire-fabric machines.

In testimony whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed at the city of [SEAL.] Washington this 5th day of April, in the year of our Lord one thousand eight hundred and ninety-eight and of the Independence of the United States of America the one hundred and twenty-second.

C. H. DUELL,
Commissioner of Patents.

Amount received, $15. Chief clerk.

APPLICATION FOR LETTERS PATENT.

I.—*Petition and Power of Attorney.*

To the Commissioner of Patents.

SIR: Your petitioner, John C. Pope, a citizen of the United States, residing at Fox in the county of Kendall and State of Illinois prays that letters patent may be granted to him for the improvement in wire-fabric machines set forth in the annexed specification.

And he hereby appoints C. A. Snow and E. G. Siggers, composing the firm of C. A. Snow & Co., of Washington, D. C., as his attorneys, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to receive the patent, and transact all business in the Patent Office connected therewith.

JOHN C. POPE.

502 II.—*Specification.*

To all whom it may concern:

Be it known, that I, John C. Pope a citizen of the United States, residing at Fox in the county of Kendall and State of Illinois have invented a new and useful wire-fabric machine of which the following is a specification:

This invention relates to wire-fabric machines; and it has for its object to provide certain improvements in machines of this character which are specially adapted for being moved along in a straight line, during work, for the purpose of weaving a line of woven-wire fencing. To this end the main and primary object of the present invention is to simplify the construction of wire-fabric or wire-fence machines, so as to render the same very easily manipulated, while at the same time quite efficient in operation to quickly weave a line of fabric or fencing.

With these and other objects in view which will readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination and arrangement of parts, hereinafter more fully described, illustrated and claimed.

In the accompanying drawings:—

Figure 1 is a front elevation of a wire-fabric machine constructed in accordance with this invention.

Figure 2 is a side elevation partly in section of the same, showing the machine in operative position.

Figure 3 is an enlarged transverse sectional view on the line *x–x* of Fig. 1.

Figure 4 is a detail elevation and top view of one of the twister wheels.

Figure 5 is an enlarged detail in perspective of one of the shiftable spool-carriers.

Figure 6 is an enlarged detail sectional view on the line *y–y* of Fig. 2.

Referring to the accompanying drawings, A represents the upright frame of the machine, supported at its lower end on the opposite flanged traveler wheels B, which are adapted to move on
503 opposite side edges of the stationary ground track C, which will be more particularly referred to as providing means whereby the machine can be easily moved along as the weaving progresses.

The frame A, is illustrated as being a single vertical upright frame piece, which is of a suitable height to adapt it for weaving any height of fence, and is provided with a longitudinal series of regularly spaced threaded openings D, which
Aug. 12, '93. receive the inner threaded ends of the stationery A elongated warp-wire tubes E. The warp-wire tubes E, may of course be secured at their inner ends into the upright frame A, so as to align with the openings or perforations D, therein, and project a distance beyond one side of the frame so as to form guides for the longitudinal line or warp wires 1. The elongated

tubes E, which project a distance beyond one side of the frame A, are provided adjacent to such frame with the reduced spindle portions F, which form bearings for the vertical series of intermeshing twister wheels G.

Aug. 12, '93. A twister wheel G, is loosely journaled on each of the
" tubes E, alongside of the frame A for a fixed rotation, and each twister wheel is provided at its inner sides and edges with the cog gear H, which intermeshes with the corresponding gear of the adjacent vertically aligned wheels, so that when one wheel is put in motion, a simultaneous motion will be communicated to every wheel in the vertical series, in order to weave the weft wires onto the longitudinal warp wires. Motion is communicated to the vertically aligned series of twister wheels G, by means of the small drive-pinion I, secured on one end of the counter-shaft i, journaled at one side of the frame A, and carrying at its other end the beveled gear wheel i^1. The beveled gear wheel i^1, meshes with a corresponding gear j, keyed on the shaft j^2, which is journaled in bearing brackets j^1, at the rear side of the frame A, and carries at its outer extremity, the crank handle j^3, by means of which the operator turns the twister wheels, in twisting the meeting weft wires around the warp wires or onto each other.

The twister wheels G, are provided in their outer faces or sides, opposite their cog gears, with the parallel rabbeted grooves K, which are arranged on each side of the tubes E, which project
504 through the wheels, and said rabbeted grooves K, are designed to be aligned with the corresponding grooves of the adjacent wheels, in order to provide means for shifting the sliding spool-carriers L, carried thereby.

The sliding spool-carriers L, are single castings having at their inner edges the flanged slide-tongues M, which register with the rabbeted grooves of the twister wheels, and are adapted to slide in the aligned grooves, so that the carriers can be shifted from wheel to wheel. The said carriers L, are further provided near their slide-tongues with the laterally extended guide or rest flanges N, which are adapted to overlap the outer faces of the twister wheels, and have circular edges corresponding to the circle of the wheels so that the carriers are held in position in each of the wheels, during rotation, as will be more clearly seen in connection with the shifting devices to be presently described, and the said carriers are further provided with the off-standing spool spindles O, and the perforated guide-lugs o, at their outer extremities, to form guides for the weft wires 2, carried on the wire spools P, which are mounted on the spindles O, and adapted to be shifted with the carriers from twister wheel to twister wheel.

As is well understood by those skilled in the art, during the operation of weaving the weft wires onto the warp wires, every alternate twister wheel is active, and, except when twisting on the top and bottom wires, when there is an uneven number, carry the spools in pairs, so that the weft wires can be either twisted together or onto the warp wires and after being twisted, these spool-carriers must

then be shifted to those twister wheels which were previously inactive, so that the weaving of the fabric or fence may be properly effected.

In order to provide for easily and quickly shifting the spool-carrier from one wheel to another, I employ the oppositely moving slide-bars Q. The oppositely moving slide-bars Q, are held in a sliding position at opposite side e-ges of the frame A, by means of the flanged guide-clips R, secured to opposite side edges of the frame and embracing the outer edges of said slide-bars, and to the upper ends of each of said bars are pivotally attached the links *r*, connected to opposite portions of the shifting lever S, pivoted to the top of the frame A, to provide means for easily moving the slide-bars up and down.

505 Fixedly secured to the front faces of each of the opposite slide-bars Q, are the oppositely arranged shifting plates T, The shifting plates T, are approximately rectangular in shape and are provided with the adjacent inner side portions *t*, which are adapted to cover or partly cover the slots of the twister wheels which are inactive, and the inner covering side portions *t*, of the shifting plates, terminate at their extremities in the curved shifting edges t^1. The curved shifting edges t^1, of the shifting plates, correspond to the curvature of the guide-flanges N, of the spool-carriers, so that when the active wheels carry the spool-carriers around therewith, the said curved shifting edges, of the shifting plates, hold the spool-carriers into the shifter wheels, and prevent the same from working into the grooves of the inactive wheels. On the other hand, when the parallel grooves of the entire vertical series of wheels have been brought into perfect alignment with each other, by manipulating the lever S, the shifting plates slide the spool-carriers into the adjacent twister wheels, it being apparent that, when shifted, the spool-carriers in one wheel will be shifted into an upper and a lower wheel, respectively.

From the foregoing it will be apparent how a line of wire fabric or wire fence can be easily woven from the machine described, and now returning to the means for moving the machine along as the weaving progresses, it will be seen that the stationary ground track C, is provided with a longitudinal ratchet flange U, at each side of the base of which are formed longitudinal guide-grooves V. The longitudinal guide-grooves V, receive the lower flanged ends of the diagonal combined brace and guide arms W, secured at their upper ends to the frame A, and braced from the same by the off-standing brace bars X. Pivoted between the guide-arms W, is the vertical dog lever Y, to the lower end of which is pivoted the gravity dog Z, which engages the ratchet flange U, in order to provide for drawing the machine along the ground to advance the weaving.

It is now thought that the construction, operation, and many advantages of the herein-described wire fencing or fabric machine will be readily apparent to those skilled in the art, and I will have it

506 understood that changes in the form, proportion and the minor details of construction as embraced within the scope of the appended claims may be resorted to without departing

from the principle or sacrificing any of the advantages of this invention.

Having thus described my invention, what I claim and desire to secure by letters patent is:

Canceled by "A" Aug. 12, '93.

1. In a wire-fabric machine, the combination of a vertically aligned series of intergeared twister wheels having face grooves, and shiftable spool-carriers having slide-tongues adapted to fit in the grooves of said wheels, substantially as set forth.

2. In a wire-fabric machine, a vertically aligned series of intergeared twister wheels having parallel rabbeted grooves, and shiftable spool-carriers having flanged slide-tongues adapted to fit in the rabbeted grooves of said twister wheels, substantially as set forth.

Canceled Aug. 12, '93.

3. In a wire-fabric machine, the frame, a vertical series of warp-wire tubes secured in and projected from said frame, a vertically aligned series of twister wheels journaled on said tubes and having face grooves, and shiftable spool-carriers adapted to fit in the face grooves of said twister wheels, substantially as set forth.

3 [4].* In a wire-fabric machine, the upright movable frame having a longitudinal series of wire openings, elongated wire tubes secured at their inner ends in said openings and provided near the frame with reduced spindle portions, grooved twister wheels journaled on the spindle portions of said tubes and having cog gears intermeshing, and shiftable spool-carriers having tongues fitting the grooves of said twister wheels, substantially as set forth.

4 [5].* In a wire-fabric machine, the frame, a vertical series of elongated warp-wire tubes fitted at their inner ends into the frame, a vertically aligned series of intergeared twister wheels journaled on said tubes alongside of the frame and having parallel rabbeted grooves in their outer faces at each side of said tubes, and shiftable spool-carriers having flanged slide-tongues adapted to fit in said rabbeted grooves, substantially as set forth.

5 [6].* In a wire-fabric machine, the combination of vertically aligned intergeared twister wheels having rabbeted grooves
507 in their outer faces adapted to be aligned, and shiftable spool-carriers having flanged slide-tongues, adapted to fit in the rabbeted grooves of the wheels, laterally extended guide-flanges

[Matter enclosed between rules erased in copy.]
[* Words and figures enclosed in brackets erased in copy.]

overlapping the outer faces of the wheels, off-standing spool spindles, and perforated wire guide-lugs at their outer extremities, substantially as set forth.

6 [7].* In a wire-fabric machine, the combination of a series of intergeared twister wheels having parallel grooves in their outer faces, shiftable spool-carriers having tongues fitting the grooves of the wheels, and laterally extended curved guide-

Aug. 12, '93. N flanges A overlapping the outer faces of the wheels

at one side of the grooves therein and vertically

Aug. 12, '93. A, and oppositely A moving shifting plates having curved shifting edges adapted to fit the curved guide-flanges of the carriers, substantially as set forth.

7 [8].* In a wire-fabric machine, the upright movable frame, a vertically aligned series of intergeared twister wheels mounted on

rabbeted

Aug. 12, '93. said frame and having parallel A grooves in their outer faces adapted to be aligned, shiftable spool-

flanged side

Aug. 12, '93. carriers having A tongues fitting the face grooves

and

Aug. 12, '93. of the wheels, A [an]* offstanding curved guide-

N

flanges A overlapping the outer faces of such wheels, oppositely moving slide-bars arranged at opposite edges of the frame, and oppositely arranged shifting plates attached to each of said slide-bars and having adjacent inner side

t'

Aug. 12, '93. portions, and curved shifting edges A at the extremity of said side portions adapted to fit the curved guide-flanges of the carriers, substantially as set forth.

8 [9].* In a machine of the class described, the combination of the stationary ground track having a longitudinal ratchet flange and longitudinal guide-grooves at the base of such flange, the traveling machine frame carrying flanged traveler wheels adapted to move on the opposite side edges of said track, combined brace and guide rods attached to the machine frame and having lower flanged ends fitting said longitudinal guide-grooves, and a vertical dog lever pivoted between said arms and carrying a

Insert B, Aug. 22, '93. gravity dog adapted to engage said ratchet flange. A

508 In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

JOHN C. POPE.

Witnesses:

JOHN FITZGERALD.
GEORGE F. POPE.

[* Words and figures enclosed in brackets erased in copy.]

III.—*Oath.*

STATE OF ILLINOIS, }
County of Kendall, } *ss:*

John C. Pope the above-named petitioner, a citizen of the United States, resident of Fox in the county of Kendall and in the State of Illinois being duly sworn, deposes and says that he verily believes himself to be the original, first and sole inventor of the improvement in wire-fence machines described and claimed in the foregoing specification; that the same has not been patented to him or to others with his knowledge or consent, in any country; that the same has not to his knowledge been in public use or on sale in the United States for more than two years prior to this application; and he does not know, and does not believe that the same was ever known or used prior to his invention thereof.

JOHN C. POPE.

Sworn to and subscribed before me this 28th day of April, 1893.

[NOTARIAL SEAL.] M. E. CORNELL,
Notary Public.

(Endorsed:) Serial No. 472,676. Paper No. —. O K. Application. Filed May 2, 1893. In the U. S. Patent Office. In the matter of the application of J. C. Pope for letters patent for improvements in wire-fence machines. Petition, oath, specification and power of attorney. U. S. Patent Office. May 2, 1893. Chief clerk.

509 Room No. 209.

All communications should be addressed to "The Commissioner of Patents, Washington, D. C."

Any communication respecting this application should give the serial number, date of filing, and title of invention.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
WASHINGTON, D. C., *June* 27, 1893.
Mailed " 28, "

Subject: Wire-fabric machine. Filed May 2, 1893. No. 472,676.

John C. Pope, care C. A. Snow & Co., city:

Please find below a communication from the examiner in charge of the application above noted.

W. E. SIMONDS,
Commissioner of Patents.

Figure 1 is criticised, on the ground that as shown the left-hand bar Q could not descend sufficiently to carry the weft-wire spool into engagement with the lower twister wheel.

In Fig. 2, the slide-bar Q is not shown as broken away correctly.

Figure 6 is nor regarded as showing what would be seen on a section of Fig. 2 at the line *y–y* (page 3, line 6).

Claims 1, 7 and 8 are rejected on 484,528, Oct. 18, 1892, Whitney wire working, fabrics making.

Claim 3 is rejected on Whitney and 432,951, July 22, 1890, Morgan same class.

In claim 8, line 6, "an" should be canceled.

The other claims are deemed allowable, subject to a probable interference.

L. W. MAXSON, *Examiner.*

JERRELL, *2d.*

(Endorsed:) John C. Pope. Serial No. 472,676. Paper No. 1. Rej. Dated June 27, 1893.

510 W. Room 209. &.

John C. Pope. Wire-fabric machine. Filed May 2, 1893. No. 472,676.

Hon. Commissioner of Patents.

SIR: I hereby amend as follows:—

Page 3 line 18 before "elong-" insert "stationary"

Page 4 line 11 after "journaled" insert "loosely"

Page 4 line 12 after "A" insert "for a fixed rotation"

Cancel claims 1 and 3 and substitute:—

"A." "1. In a wire-fabric machine, the upright frame piece having a series of regularly spaced openings, stationary elongated warp-wire tubes fitted at one end in said openings, a vertically aligned series of intergeared twister wheels loosely journaled on said stationary tubes and having parallel face grooves, shiftable spool-carriers having tongues registering with the grooves in said wheels, and shifting devices for sliding the spool-carriers from one wheel to the other, substantially as set forth."

Claim 7 line 5 after "flanges" insert "N"

Claim 7 line 6 after "wheels" insert "at one side of the grooves therein;" and after "oppositely" insert "and vertically"

Claim 8 line 3 before "grooves" insert "rabbeted"

Claim 8 line 5 before "tongues" insert "flanged slide"

Claim 8 line 6 change "an" to "and;" and after "flanges" insert "N"

Claim 8 line 11 after "edges" insert "t"

The drawings have been amended in the particulars criticised.

The amendments herewith presented to the present application clearly distinguish the same from the references of record. Neither the patents to Whitney nor Morgan show "stationary warp-
511 wire tubes combined with intergeared twister wheels loosely journaled on the tubes and having face grooves to receive the tongues of the spool-carriers."

Amended claims 7 and 8 find no equivalent construction in the patents to Morgan and Whitney. "The oppositely and vertically

moving shifting plates" are not found at all in these two patents, and much less their combination with the curved flange 'N' of the spool-carriers."

In view of the above an early allowance is anticipated.

Respectfully submitted,

J. C. POPE,
By C. A. SNOW & CO.,
His Attorneys.

Washington, D. C., August 9, 1893.

(Endorsed:) Serial No. 472,676. Paper No. 2. Amendment. Filed August 12, 1893. John C. Pope. "A." U. S. Patent Office. Aug. 12, 1893. Division XIV.

Issue division.

All communications should be addressed to "The Commissioner of Patents, Washington, D. C."

Serial No., *672,676.*

DEPARTMENT OF THE INTERIOR,
U. S. PATENT OFFICE,
WASHINGTON, D. C., *Aug.* 19, 1893.

John C. Pope, c/o C. A. Snow & Co., city.

SIR: Your application for a patent for an improvement in wire-fabric machines filed May 2, 1893, has been examined and *allowed.*

The final fee, twenty dollars, must be paid, and the letters patent bear date as of a day not later than *six months* from the time of this present notice of allowance.

If the final fee is not paid within that period the patent
512 will be withheld, and your only relief will be by a renewal of the application, with additional fees, under the provisions of section 4987, Revised Statutes. The office aims to deliver patents upon the day of their date, and on which their term begins to run; but to do this properly applicants will be expected to pay their final fees at least *twenty days* prior to the conclusion of the six months allowed them by law. The printing, photolithographing, and engrossing of the several patent parts, preparatory to final signing and sealing, will consume the intervening time, and such work will not be done until after payment of the necessary fees.

When you send the final fee you will also send, *distinctly and plainly written*, the name of the *inventor* and *title of invention as above given*, *date of allowance* (which is the date of this circular), *date of filing*, and, if assigned, the *names of the assignees.*

If you desire to have the patent issue to *assignees*, an assignment containing a *request* to that effect, together with the *fee* for recording the same, must be filed in this office on or before the date of payment of final fee.

Additional copies of specifications and drawings will be charged

for at the following rates: Single copies, uncertified, 10 cents each. The money should accompany the order.

Very respectfully, JOHN S. SEYMOUR,
Commissioner of Patents.

☞In remitting the final fee give the serial number at the head of this notice.

The within title is that given by the examiner in charge, as most appropriate to your invention. Should you desire a change in the same, satisfactory reasons must be given therefor on or before the payment of the final fee.

☞After allowance, and prior to payment of the final fee, applicants should carefully scrutinize the description to see that their statements and language are correct, as mistakes not incurred through the fault of the office and not affording legal grounds for reissues will not be corrected after the delivery of the letters patent to the patentee or his agent.

513 W. Room 209. &.

John C. Pope. Wire-fabric machine. Filed May 2, 1893. No. 472,676.

Hon. Commissioner of Patents.

SIR: I hereby amend as follows:—

Add the following claims:—

B. Aug. 22, '93.

"9. In a wire-fabric machine, the upright frame having openings, stationary warp-wire tubes secured to said frame and aligning with the openings therein, a series of aligned twister wheels loosely journaled on said stationary tubes, and shiftable spool-carriers mounted to slide on said wheels, substantially as set forth.

10. In a wire-fabric machine, the upright frame having openings, stationary warp-wire tubes fitted at one end in said openings, a series of aligned twister wheels loosely journaled on said stationary tubes, and shiftable spool-carriers having a sliding tongue-and-groove connection with the twister wheels, substantially as set forth."

Applicant requests the examiner to enter and consider the added claims herewith presented. These claims are drawn to constructions which applicant feels himself entitled to protection on over the references of record, and in view of the fact that the applicant is well aware of the pendency of an application for a patent by W. D. Whitney, of Clarendon N. Y., for substantially the same subject-matter, he, applicant is desirous of having an interference declared between his application and the said application of Whitney, in order that the priority of the inventions may be proved.

Whitney is manufacturing and placing on the market for sale the machine covered by his pending application, and applicant has therefore had ample opportunity to positively know that Whitney

has such an application pending, and inasmuch as applicant has already invented a similar machine and made application for a patent thereon, he feels that an interference between the two applications is the only proper course to secure equity for both
514 parties. The new claims herewith presented have therefore been drawn to cover broadly the essential features shown in both of the inventions, and are deemed sufficiently broad to raise an interference issue.

Inasmuch as the official notice of allowance has not yet been sent to applicant, it is not thought that there should be any hesitancy in admitting the present amendment, but it may be well to state that applicant's assignee, having become acquainted with the fact of the pendency of the Whitney application, has made haste to come on to Washington to consult with the attorneys in charge of the case, and did only arrive in the city yesterday, so therefore the present amendment has been submitted without even the slightest delay. While there is no assignment on the record in this case, still it may be stated that such an assignment will be filed today.

In view of the above the examiner is respectfully requested to approve and favorably consider the amendment herewith presented.

Respectfully submitted,

JOHN C. POPE,
By C. A. SNOW & CO.,
His Attorneys.

Washington, D. C., August 19, 1893.

(Endorsed:) Serial No. 472,676. Paper No. 3. Special amendment. Filed Aug. 22, 1893. John C. Pope. Examination of the records shows that applicant is entitled to allowance of the claims herein presented. The case was allowed Aug. 19, 1893, but the final fee has not been paid. In view of the facts presented entry of the amendment is recommended under rule 78. Respectfully submitted, Louis W. Maxson, examiner div. 14. Aug. 22, 1893. Withdrawal approved. S. T. Fisher, acting Com'r. Aug. 22, 1893. Case withdrawn from files of Issue and Gazette division Aug. 22, 1893. S. M. P. U. S. Patent Office. Aug. 22, 1893. Division XIV.

515 Issue division.

All communications should be addressed to "The Commissioner of Patents, Washington, D. C."

Serial No. 472,676.

DEPARTMENT OF THE INTERIOR,
U. S. PATENT OFFICE,
WASHINGTON, D. C., *Aug.* 24, 1893.

John C. Pope, ass'or, c/o C. A. Snow & Co., city.

SIR: Your application for a patent for an improvement in wire-fabric machines filed May 2, 1893, has been examined and *allowed*.

The final fee, twenty dollars, must be paid, and the letters patent

bear date as of a day not later than *six months* from the time of this present notice of allowance.

If the final fee is not paid within that period the patent will be withheld, and your only relief will be by a renewal of the application, with additional fees, under the provisions of section 4987, Revised Statutes. The office aims to deliver patents upon the day of their date, and on which their term begins to run; but to do this properly applicants will be expected to pay their final fees at least *twenty days* prior to the conclusion of the six months allowed them by law. The printing, photolithographing, and engrossing of the several patent parts, preparatory to final signing and sealing, will consume the intervening time, and such work will not be done until after payment of the necessary fees.

When you send the final fee you will also send, *distinctly and plainly written*, the name of the *inventor* and *title of invention as above given*, *date of allowance* (which is the date of this circular), *date of filing*, and, if assigned, the *names of the assignees*.

If you desire to have the patent issue to *assignees*, an assignment containing a *request* to that effect, together with the *fee* for recording the same, must be filed in this office on or before the date of payment of final fee.

Additional copies of specifications and drawings will be
516 charged for at the following rates: Singles copies, uncertified, 10 cents each. The money should accompany the order.

Very respectfully, JOHN S. SEYMOUR,
Commissioner of Patents.

☞In remitting the final fee give the serial number at the head of this notice.

The within title is that given by the examiner in charge, as most appropriate to your invention. Should you desire a change in the same, satisfactory reasons must be given therefor on or before the payment of the final fee.

☞After allowance, and prior to payment of the final fee, applicants should carefully scrutinize the description to see that their statements and language are correct, as mistakes not incurred through the fault of the office, and not affording legal grounds for reissues, will not be corrected after the delivery of the letters patent to the patentee or his agent.

Amount received, $20. Chief clerk.

Memorandum of Fee Paid at U. S. Patent Office.

(Be careful to give correct serial No.)

Serial No. 472,676, 18—.

Inventor:
John C. Pope.

Patent to be issued to
—— ——.

Name of invention, as allowed:
Wire-fence machine.

Date of payment:
Sept. 6, '93.

Fee:
$20.

Date of filing:
May 2, '93.

Date of circular of allowance:
Aug. 24, '93.

The Commissioner of Patents will please apply the accompanying fee as indicated above.

C. A. SNOW & CO., *Attorney.*

Send patent to assignee Ridgeville Ind.

(Endorsed:) U. S. Patent Office. Sep. 6, 1893. Chief clerk. Div. XIV.

517 (Serial number,) 472,676 1893. (Ex'r's Book,) 69

Patent No. 505,607.

John C. Pope, ass'or to Alva L. Kitselman and Davis M. Kitselman, of Ridgeville, Ind.

Of Fox,
County of ——
State of Illinois.

Invention: Wire-fabric machine,

Parts of application filed.

Petition	May 2, 1893.
Affidavit	" " "
Specification	" " "
Drawing 2 sh'ts,	" " "
Model.	Not required.
Specimen	——
First fee cash	$15, May 2, '93.
" " cert.	——

App. filed complete May 2, '93.
2 —
Aug. 22, 1893, L. W. Maxson.
Examined Aug. 17, 1893, L. W. Maxson.
Countersigned: S. M. Pool, S. M. Pool Aug. 23, '93. For Commissioner.
3. Notice of allowance Aug. 19, 1893.
" " 24 "
Final fee cash $20 Sept. 26, 1893.
" " cert. , 189–.
Patented September 26, 1893.
C. A. Snow & Co., city.

518 & 519 1893.

Contents.

Application — papers. O K.
1. Rej. June 27, 1893.
2. Amend't "A" Aug. 12, 1893
3. { Withdrawn from issue Aug. 22 / 93.
{ Amendment B, Aug. 22, 1893.
4.
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11.
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15.
16. 140. Wire working,
17. Fabrics making.
18.
19.
20.
21.
22.
23.
Title: Improvement in wire-fabric machines.

(Endorsed:) U. S. Patent Office. Copy made April 5, 1898.
46,601 / 98.

535 United States Patent Office.

ALVA L. KITSELMAN, of Ridgeville, Indiana, assignor of one-third to Davis M. Kitselman, of same place.

Wire-fabric Machine.

Specification forming part of Letters Patent No. 356,322, dated January 18, 1887. Application filed August 13, 1886. Serial No. 210,818. (No model.)

To all whom it may concern:

Be it known that I, Alva L. Kitselman, a citizen of the United States, residing at Ridgeville, in the county of Randolph and State of Indiana, have invented a new and useful improvement in wire-fabric machines, of which the following is a specification.

My invention relates to machines for making twisted wire fabric for use as fencing and analogous purposes; and it consists of the peculiar combination and novel construction and arrangement of the various parts for service, substantially as hereinafter fully set forth, and particularly pointed out in the claims.

The primary object I have in view in my invention is to provide a simple and easily-operated machine of the class named which can be adapted for use in the open field or other place for the construction of fences, as well as a stationary or fixed machine for the manufacture of wire fabric.

A further object of my invention is to provide a machine of the class specified which can be adapted for the manufacture of different classes or designs of wire fabric and fences, when used as either a portable or stationary apparatus, without requiring any adjustment or interchange of its parts.

(Here follow diagrams marked pp. 520, 522, 524, 526, 528, 530, 532, & 534.)

(No Model.) 8 Sheets—Sheet 1.

A. L. KITSELMAN.

WIRE FABRIC MACHINE.

No. 356,322. Patented Jan. 18, 1887.

Fig. 1.

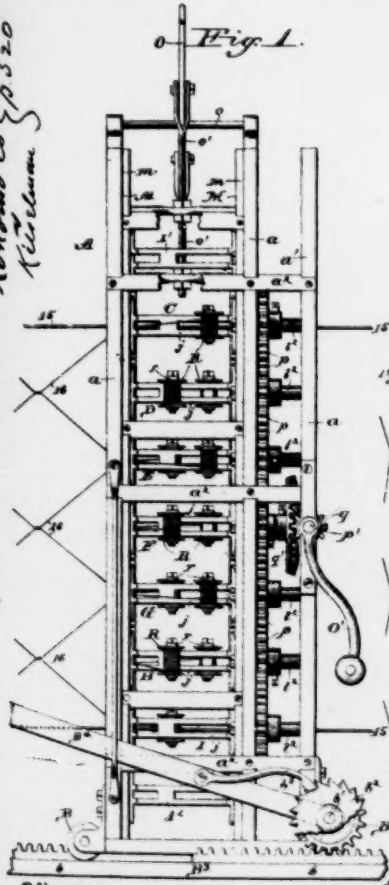
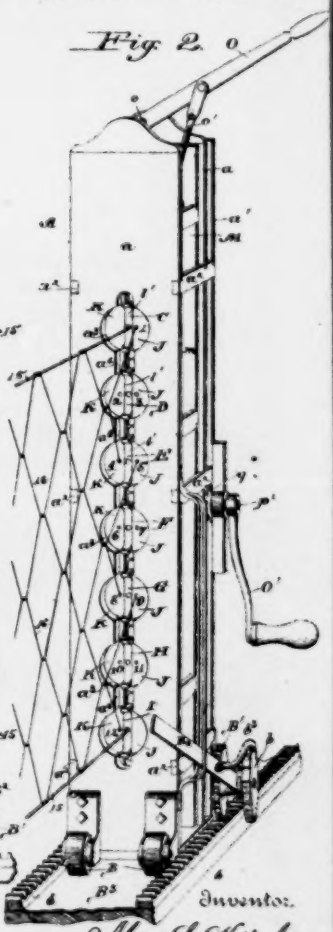


Fig. 2.



Witnesses

Roy C. Brown

W. E. Randall

Inventor.

Alva L. Kitselman

By his Attorneys

C. A. Snow & Co.

(No Model.) 3 Sheets—Sheet 2.

A. L. KITSELMAN.

WIRE FABRIC MACHINE.

No. 356,322. Patented Jan. 18, 1887.

Fig. 3.

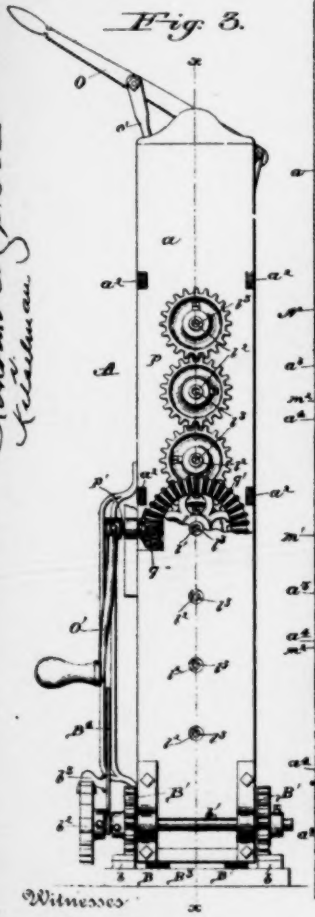
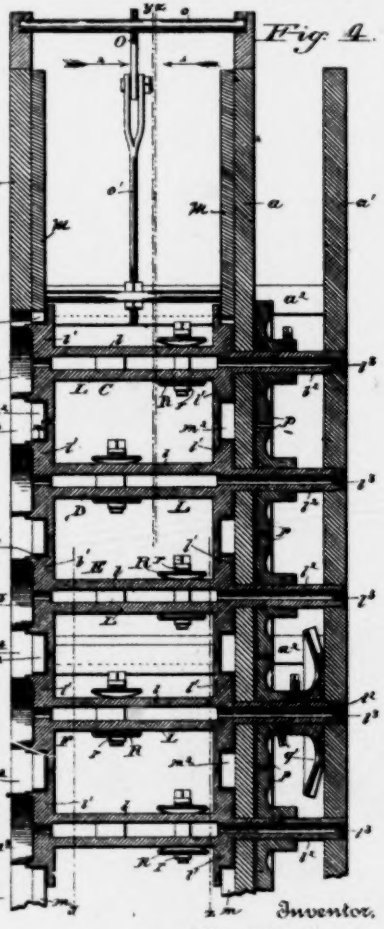


Fig. 4.



Witnesses

Roy L. Brown

H. Brucker

Inventor.

Alva L. Kitselman.

By his Attorneys

C. A. Snow & Co.

(No Model.) 5 Sheets—Sheet 2.

A. L. KITSELMAN.

WIRE FABRIC MACHINE.

No. 356,322. Patented Jan. 18, 1887.

Fig. 5.

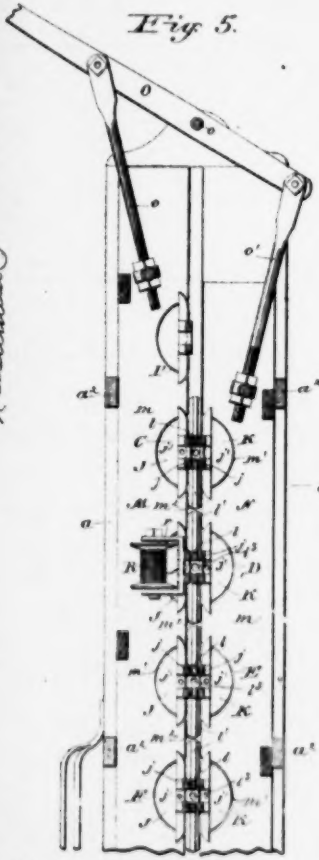
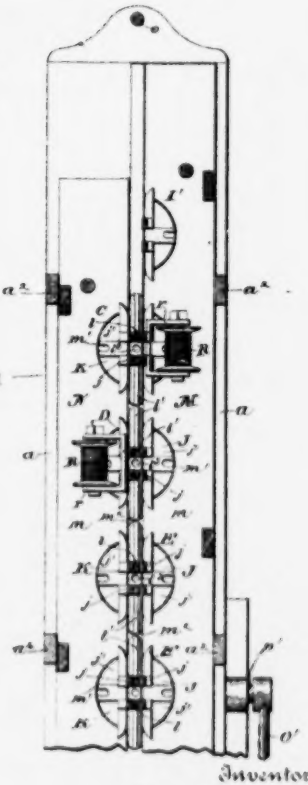


Fig. 6.



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A. L. KITSELMAN.

WIRE FABRIC MACHINE.

No. 356,322. Patented Jan. 18, 1887.

Fig. 3.

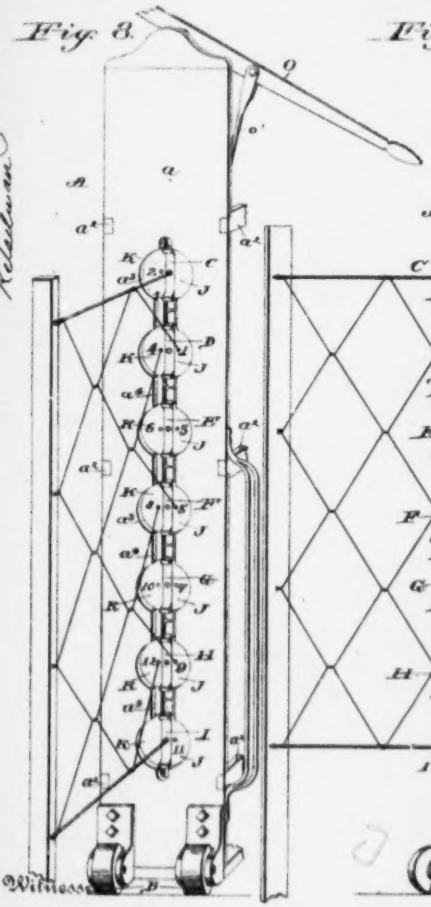
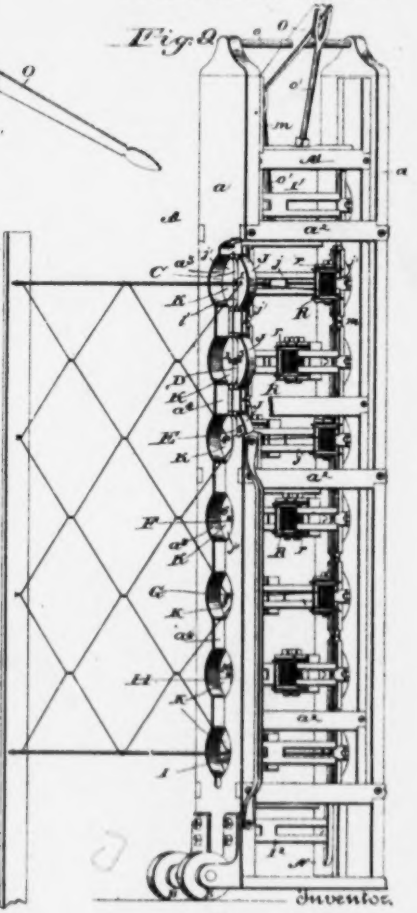


Fig. 2.



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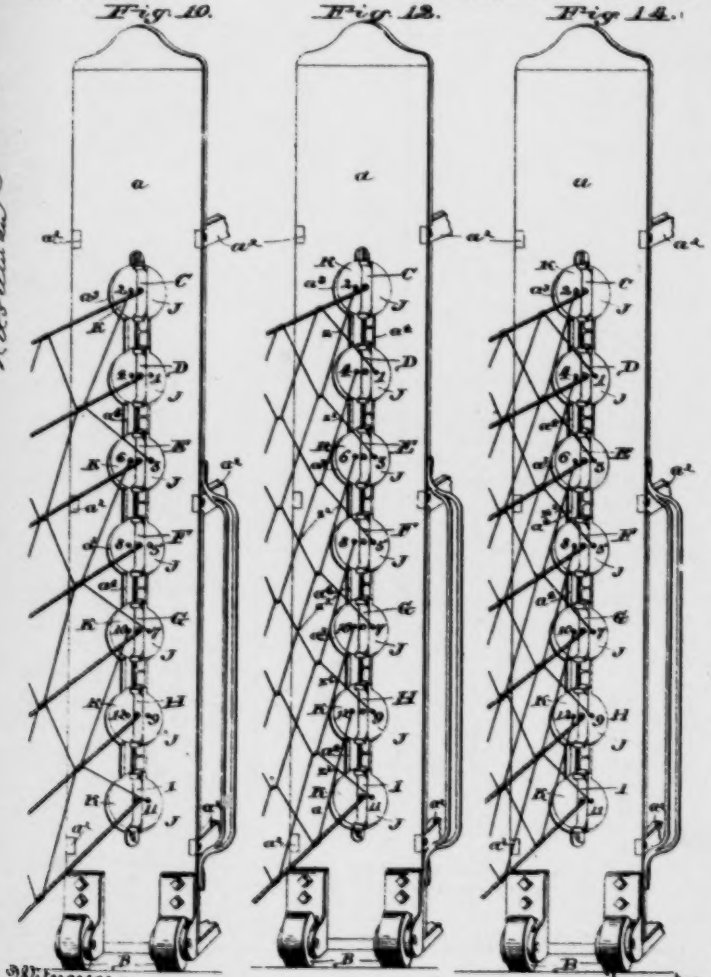
WIRE FABRIC MACHINE.

No. 356,322. Patented Jan. 18, 1887.

Fig. 10. Fig. 12. Fig. 14.



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WIRE FABRIC MACHINE.

No. 356,322. Patented Jan. 18, 1887.

Fig. 13.

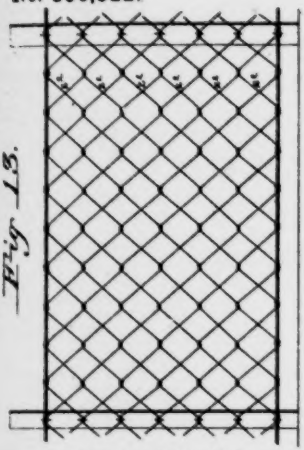


Fig. 21.

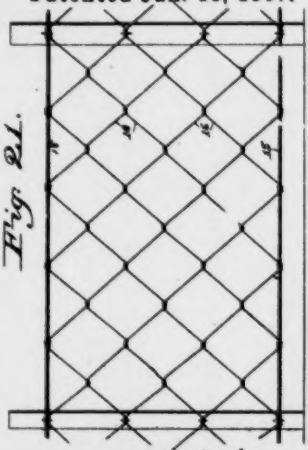


Fig. 11.

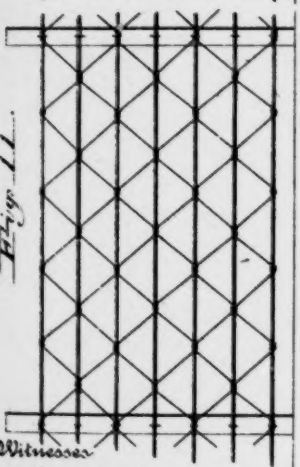
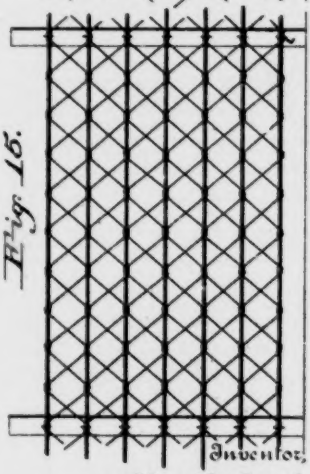


Fig. 15.



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Kitselman

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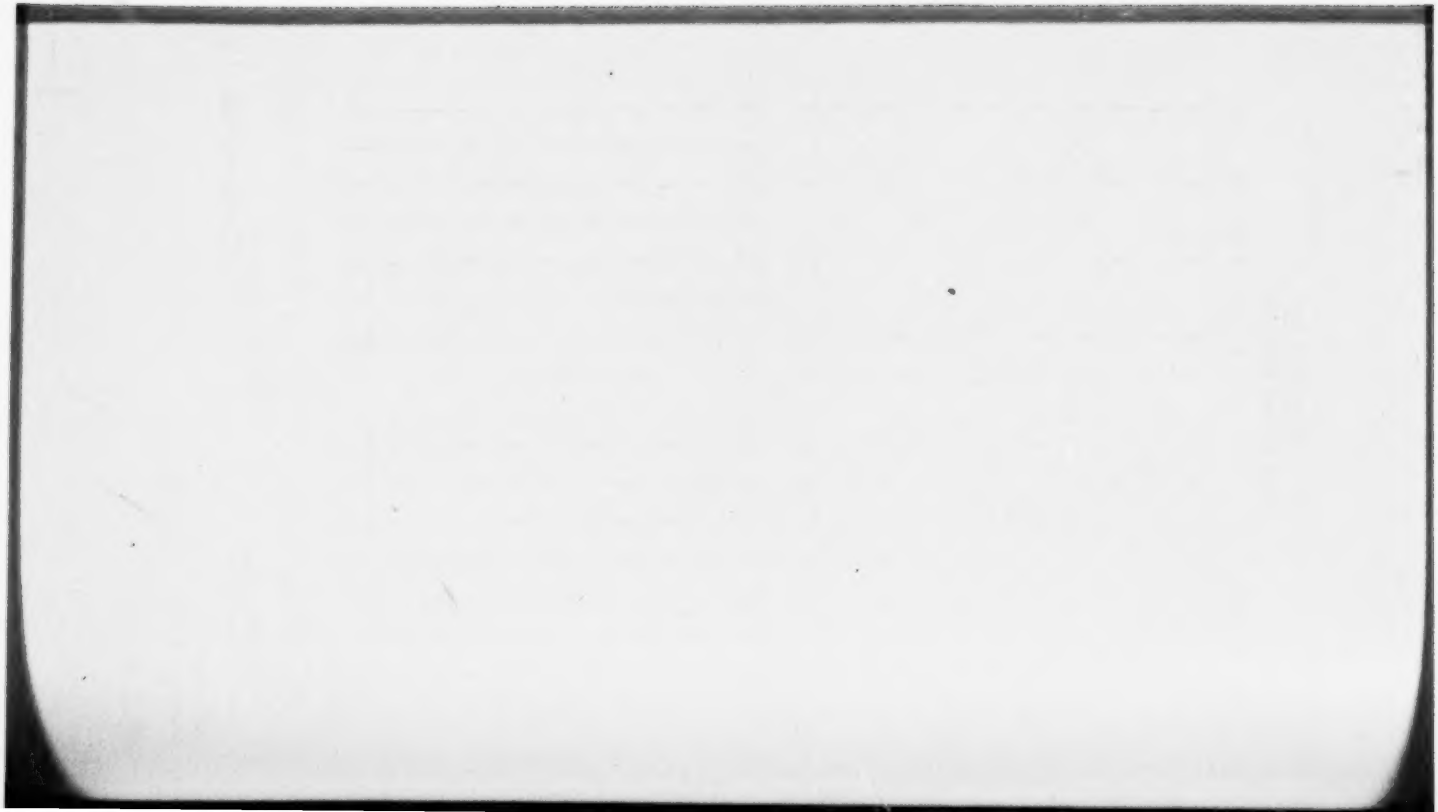

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A. L. KITSELMAN.

WIRE FABRIC MACHINE.

No. 356,322. Patented Jan. 18, 1887.

Fig. 18.

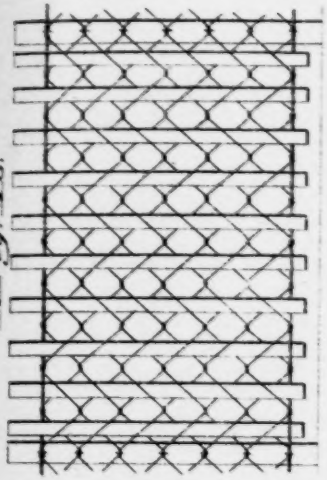


Fig. 20.

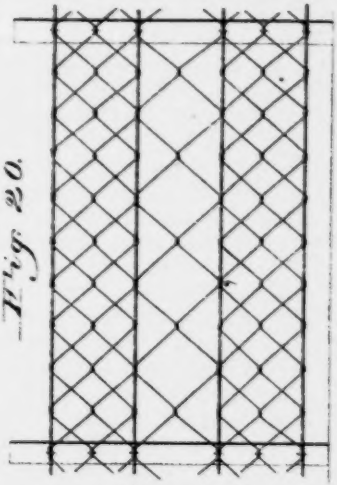
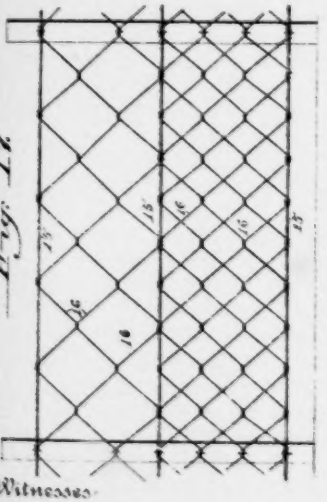


Fig. 17.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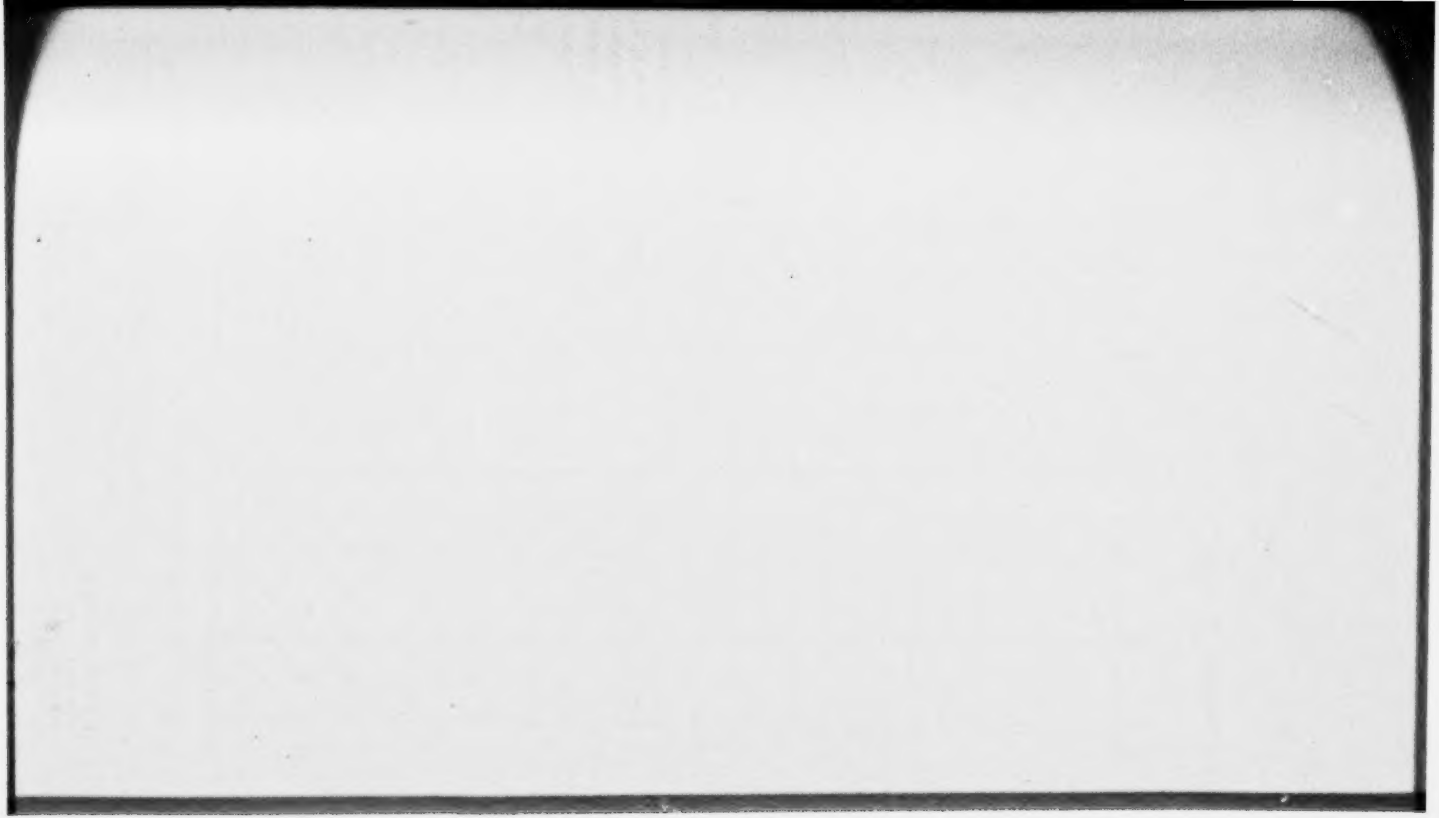

In the drawings hereto annexed, which illustrate a wire-fabric machine embodying my invention, figure 1 is a side elevation of the machine in its portable form, the same being mounted on wheels and running or traversing on a track which is placed in the open field or road, so that it is adapted for making or constructing the fence as it is moved or fed along. Fig. 2 is a front elevation with the twisters threaded to form the style of fence illustrated in Fig. 21. Fig. 3 is a rear elevation with a portion of the casing or main frame broken away to show details of construction. Fig. 4 is a vertical longitudinal sectional view on the line $x\ x$ of Fig. 3. Fig. 5 is a vertical transverse sectional view on the line $y\ y$ of Fig. 4, looking in the direction of the arrow 1. Fig. 6 is a similar sectional view corresponding to Fig. 5 on the line $z\ z$ of Fig. 4, looking in the direction of the arrow 2. Fig. 7 is a detail perspective view of one of the sectional twisters with the parts or sections thereof separated from one another. Fig. 8 is a partial front elevation differing from Fig. 2 in showing the position of the twisters after the vertically-movable frames or slides have been operated. Fig. 9 is a partial side elevation illustrating the position of the slides or vertically-movable frames after they have been adjusted. Fig. 10 is a partial front elevation showing a different manner of threading the twisters. Fig. 11 is an elevation taken from one side of the fence that is made by the machine when it is threaded as shown in Fig. 10. Fig. 12 is a partial front elevation showing another method of threading the twisters. Fig. 13 is an elevation of the plan of fence made when the machine is threaded as shown in Fig. 12. Fig. 14 illustrates another plan of threading the twisters. Fig. 15 is a view of the style of fence made by the machine when it is threaded as shown in Fig. 14. Fig. 16 is a view of another style of fence with the corresponding plan of threading the disks or twisters. Figs. 17, 18, 19, and 20 are views of additional styles of fencing which may be made with my machine. Fig. 21 is an elevation of the style of fence made when the machine is threaded as shown in Fig. 2.

Referring to the drawings, in which like letters of reference denote corresponding parts in all the figures, A designates the main frame or casing of my improved wire-fabric machine.

When the apparatus is to be constructed in portable form, so that it is adapted for use in the open field, road, or other place for putting up or constructing fences as the fabric is turned out or manufactured by the same, the carrying frame A comprises the vertical standards or uprights $a\ a$ and a', which are arranged parallel with each other and connected and braced by suitable cross or transverse pieces, a^2; but the shape of this frame is immaterial, and I would have it understood that I hold myself at liberty to vary and change the same as may be desired.

When the machine is to be transported and used in the open field, it is mounted upon supporting rollers or wheels B and B′, which are arranged in pairs at the front and rear ends thereof, respectively. The front rollers or wheels, B, are provided with smooth or plane peripheries and travel on the smooth surface of a board or other suitable track, B^3, that is placed

on the ground or other place, and the rollers B′ are provided with teeth on their peripheries, as clearly shown in the drawings, the said toothed wheels meshing with the racks *b*, that are arranged at the sides of the board or track B^3 and rigidly affixed or secured thereto in any suitable manner. The toothed wheels mesh with the toothed surface of the track, so that when they are rotated by the means which I will presently describe the main frame and the various parts of the operating mechanisms will be drawn along and thus fed at the required or proper rate, and the wheels B, with the smooth peripheries, are arranged comparatively close together, so that they will bear on the track between the racks or toothed surfaces at the sides of the latter, whereby the frame is rendered very steady in its movement.

The toothed supporting wheels are rigidly affixed in any suitable manner to a common shaft, *b′*, so as to rotate or turn therewith, and this shaft is journaled in suitable bearings on the main frame at the lower rear side thereof. One of the ends of this shaft *b′* is extended beyond the sides of the vertical main frame, and to this extended end is rigidly affixed a ratchet-wheel, b^2, with the teeth of which engages the pointed or free end of a pawl, b^3, that is pivoted on and carried by a hand or operating lever, B^4, which is provided with an eye or opening at one end, through which the shaft is passed, so that the lever is supported on the shaft and free to move thereon independently of the same. This ratchet mechanism is designed to be operated by hand to feed the frame and other parts of the mechanism along to any required distance; but I do not intend to restrict myself to the peculiar construction and arrangement of the parts of the same, as they can be varied without departing from the spirit of my invention.

The distance which the main frame can be moved can be easily and readily regulated or varied by the operator by causing the pawl of the hand-lever to slip over two, three, or more teeth of the ratchet-wheel, so that the mesh of the wire fabric or fence can be made of uniform size or varied as may be necessary, according to the design of fabric selected, as will be very readily understood.

The main frame A carries a series of devices for twisting the wire into open spaces or loops, and, for the sake of clearness and convenience, in describing or referring to these devices hereinafter I will term them as "twisters." Any preferred or desired number of these twisting devices may be employed that may be deemed desirable or necessary, and in the accompanying drawings I have shown a series of seven, and will confine my description of the operation of the machine to this number of these devices; but I would have it understood that I hold myself at liberty to vary and change the number thereof to adapt the machine to manufacturing wire fabric of any desired width, or to constructing fences of varying or different heights.

In order to render the operation of my machine more clear and explicit, I have lettered these twisters C D E F G H I. The twisters from C to I, inclusive, form the active twisters, and at the top and bottom I provide two inactive twisters, I′ I^2; and in describing the

process of manufacturing the different classes or kinds of fabric I will describe the method or manner of threading the twisters, and also in which the fabric is formed. Each of these active twisters consists, essentially, of two oppositely-movable sections, J and K, and a stationary section, L, these terms being used for the purpose of distinguishing the parts of the twisters. In Fig. 7 of the drawings I have shown one of these active twisters with the parts detached from each other, and will now describe the said parts separately from each other. The oppositely-movable sections J K of each of the active twisters are made precisely or substantially alike, and they each consist of a tie or connecting bar, *j*, and two segmental heads, *j'*, which are formed integral with the tie-bar and at the extremities of the latter. These segmental heads of the movable sections of the twisters are placed on opposite sides of the stationary sections of the twisters, so that the flat sides of the said segmental heads of the movable sections impinge or bear against the stationary section on their flat or straight sides, and their outer curved edges form a complete circle, whereby the stationary and movable sections of the twisters are adapted to impinge upon each other and to revolve together, so as to form the twist in the loop during the process of manufacturing the fabric.

As before stated, each of the movable sections of each twister is cast or formed in a single piece of metal, and the segmental heads *j'* of the twister-sections are each provided with a transverse aperture or opening, j^2, except one of the movable sections of the upper and lower twisters, C I, respectively, for the free passage of the wire, as more fully described presently, and said heads are further provided with radial or outwardly-projecting arms or ribs *k*, which impinge or bear against the sliding frames to prevent longitudinal play of the same. These arms are also formed or cast with the twister-sections, and they are arranged to project beyond the periphery of the segmental heads, and at or near the straight inner side thereof, for the purpose described.

The stationary or immovable section L of each twister consists of a tie or connecting bar, *l*, and the flat heads or ends *l'*, formed or cast in a single piece therewith at opposite extremities of the tie or connecting bar, the heads or ends of the tie-bar being made of the same thickness or width as the bar itself, so that the sides of the tie-bar and heads thereof are in line with each other. The extremities of the heads *l'* of the central stationary section of each
537 twister are extended beyond the upper and lower sides of the tie or connecting bar, as at l^4, so that when the said central section is rotated with the side sections of the twister to form the twist in the loop the extended ends l^4 will impinge upon the inner sides of the main carrying-frame, and thereby prevent the central section from longitudinal movement. The stationary section of each twister has a cylindrical shaft or bearing-piece, l^2, cast in a single piece therewith, and this shaft is arranged at the rear end of the section and projects outwardly beyond one of the heads thereof, as shown, the shaft and the heads of the tie-bar being provided with passages or openings l^3, which are in line with each other, so that

the warp-wires of the fabric or fence can pass through the said openings very freely without hindrance or danger of becoming entangled with other parts of the apparatus.

The inactive twisters I and I′ are arranged at the upper and lower ends of the main frame and on opposite sides of the central sections of the active twisters, and said inactive twisters are merely fitted in and carried by the sliding frames to coincide with the central sections of the active twisters C I; but they do not affect the operation of the machine.

M and N designate the sliding frames, which are arranged within the uprights *a a* of the main frame A and on opposite sides of the twisters. These sliding frames each consist of two vertical pieces, *m*, which are connected by suitable transverse pieces to render the frame rigid and strong, and which bear against the inner sides of the uprights *a* of the main frame. The upright *a* at the front of the main frame and the uprights *m* of each of the sliding frames are each provided with an opening or aperture, a^3 and *m′*, respectively, the opening a^3 of the main frame being circular, and the openings *m′* of the sliding frames are formed on the inner edges of the sliding frames and semicircular, so that when the sliding frames coincide the said openings or recesses *m′* register to form a complete circle, and these openings a^3 in the front uprights, *a*, of the main frame are connected by vertical slots or passages a^4, and a space, m^3, is left between the contiguous edges of the sliding frames for the stationary sections L, as will be very readily understood. The openings a^3 and *m′* of the main and sliding frames are adapted to register or coincide, and they are equal in diameter to the diameter of the circle formed by the semicircular heads or disks at the ends of the movable sections of the twisters. It will thus be seen that I provide one of the uprights of the main frame and both uprights of the sliding frames with a series of circular openings, which are connected by intermediate spaces or slots, and that these openings and slots or spaces are arranged one above the other in vertical lines. The circular openings in the said main and sliding frames correspond in number with the number of twisters employed.

The twisters are arranged in series one above the other, and the stationary section of each of the twisters is fitted between the contiguous edges of the sliding frames and located between the movable sections of the twisters, which are thus disposed on opposite sides of the stationary section. The central stationary sections of all of the twisters are arranged in a vertical line, and they are fitted or so arranged that the heads at the extremities thereof are fitted in the straight slots or spaces m^3 intermediate of the semicircular openings in the contiguous edges of the vertically-sliding frames, the shaft of the stationary section of the twister being passed through and suitably journaled in the rear uprights, *a* and *a′*, of the main frame, so that the stationary section of the twister is prevented from movement or play in a vertical line. The segmental heads at the extremities of the movable section of each twister are fitted so as to rotate very freely in the opening *m′* in the sliding frame, and the straight faces of the heads of the movable sections and the tie or connect-

ing bars thereof are normally in contact with the head and tie-bar, respectively, of the corresponding stationary or central section of the twister, whereby all three of the sections of each of the twisters are adapted to be rotated in vertical planes together or simultaneously for the purpose of forming the twist in one of the loops of the fabric, all of the said series of twisters being geared together to adapt them to be rotated at one operation in order to twist the wires in the series of loops simultaneously.

From the foregoing description, taken in connection with the drawings, it will be seen that the heads of each section of each twister are fitted in the opening or recess in one of the sliding frames M or N, and when these frames are moved vertically these movable sections of the twisters are carried or moved with their respective frames, so that they are caused to coincide or register with a stationary central section of a twister above or beneath the section from which the movable section started before the sliding frame was shifted. Thus, for instance, when the sliding frame N is moved upwardly, the sections K of the twisters E and F are carried with it and caused to register with the stationary sections of the twisters D E, respectively, as will be very readily understood. The object of thus shifting or moving the sections J K of the twisters is to cause the wires that are fed therethrough to cross or incline, in order to prepare the wires for the subsequent operation of twisting them, which is accomplished by rotating the twisters one or more times, as may be desired, all as hereinafter more fully described.

The sliding frames M N and the movable sections of the twisters carried thereby are operated or shifted vertically in opposite directions by a single movement of a single hand-lever, O—that is, when the frame M is moved upwardly, the frame N will be forced downwardly, and *vice versa*. This hand-lever O is journaled or
538 fitted near one end on a central pin or shaft, *o*, that is rigidly supported in the upper end of the main frame A, and the said lever is connected with the shifting or sliding frames by intermediate links, *o'*, which are pivotally connected with the lever and the frames, as is obvious.

Each of the shafts of the central section, L, of each twister is provided with a spur-gear wheel, *p*, which is rigidly secured thereto, so as to rotate therewith, and these gear-wheels are all of the same diameter and have the same number and proportion of teeth, so that all of the twisters are rotated at the same rate of speed and describe a complete circle or revolution in the same space of time. The gear-wheels mesh with each other, so that all of the twisters are rotated simultaneously, and these gear-wheels are operated at one time by a single crank, O', that is arranged at one side of the machine, and is secured on a shaft, *p'*, which is journaled in suitable bearings affixed to the upright *a'* of the main frame, the said shaft having a small bevel gear-wheel or pinion, *q'*, which meshes with a larger bevel gear-wheel, *q'*, on one of the shafts of one of the stationary sections of one twister. It will be seen that by rotating the crank the motion thereof will be communicated to the shaft of one of the twisters

through the bevel gear-wheel and pinion, and as all of these shafts are geared together the twisters are rotated simultaneously.

The warp-wires that compose the fabric are passed or threaded through the central section of the twisters through the aligned openings therein, and the woof-wires of the wire fabric or fence are passed through the transverse perforations or openings in the semicircular disk or head of the movable sections of the twisters.

The warp-wires are wound or coiled in bundles as they leave the factory, and they are unwound in rear of the machine and stretched for a suitable distance—say fifty rods—upon the posts in rear of the machine, and they serve as stays to aid in keeping the machine vertical, the said warp-wires being passed through suitable openings in the upright *a'*, thence through the shaft of the central stationary section of the twister, then through the aligned openings therein, and out of the opposite side of the machine through the circular openings in the upright *a* at the front of the main frame. The woof-wires are coiled upon spools or bobbins R, that are loosely journaled in brackets *r*, which are affixed very rigidly to the outside of the movable side sections of the twisters by means of suitable bolts or screws, which are passed through the brackets, and the tie-bar of the movable section, each of the said movable sections of the twisters, except the inactive sections I I' and one of the movable sections of the twisters C I, being provided with a spool or bobbin, which is carried thereby and rotates therewith during the operation of twisting the wire *b* to form the loops. The wire from these spools or bobbins R is passed through the transverse opening in the head of the movable side sections of the twisters, and thence through the circular opening in the front upright, *a*, of the main frame. One of the movable sections of the twisters C and I at the extreme upper and lower ends of the machine, however, is not provided with the bobbins R for the woof-wires, because when the shifting frames M N are moved vertically one section of one twister C and the section of the twister I on the opposite side of the stationary central sections of all of the twisters will be thrown above and beneath the circular openings in the main frame, and hence it is impossible to pass or feed the woof-wires through the said movable section of the twisters therein, and when the frames M N are shifted to one position, as in Fig. 8, the inactive sections I I' are adjusted to register with the stationary sections L of the twisters C I, the inactive twisters being provided merely to properly rotate the twisters C I. The warp-wires, however, are passed through the central stationary sections of the said twisters.

In order to attain a clear understanding of the shifting of the movable side sections, J K, of the active twisters by the sliding frames M N, I shall designate the central stationary sections by the reference-letters which distinguish the twisters from each other—as, for instance, C D E, &c.—and the movable side sections of the twisters by the numerals from 1 to 12, inclusive, as clearly shown in the end elevations.

To make the style of fence shown in Figs. 1 and 21 of the drawings I proceed to thread the twisters as follows: The end twisters

C I are threaded with the large wire, which is to form the warp, by passing it through the aligned openings in the central stationary part or section thereof, and the smaller-sized wires, that form the woof of the fabric, are then passed through the twister-heads 1, 4, 5, 8, 9, and 12, and it will thus be seen that no wires are passed through the twister-heads 2, 3, 6, 7, 10, and 11, and the inactive twisters I I′, and the blank sections of twisters C I. When using the machine to construct a fence in the field, one end of the large wires from the central section of twisters C I is attached to the fence-post just beyond the machine. The large wires 15, which pass through the central sections of the upper and lower twisters C I, form the warp for the woven-wire netting or fabric, while the smaller wires 16, which are inserted through the heads of the side movable sections of the twisters, form the weft or woof of the netting. The wires 15 should be stretched taut by means of suitable stretchers located any desired distance from or in rear of the machine; but I have not deemed it necessary that these stretchers shall be shown, as any device for accomplishing this end can be used. With the warp-wires 15 arranged as shown and described to form the selvage of the wire netting or fabric, and the weft or woof wires arranged through the twister-heads of the sections J K, to make the style of fence in Figs.
539 1 and 21, I proceed as follows: The lever O is pressed down to move the slide M downward and by the same movement force the sliding frame N upward, inasmuch as the slides move in opposite directions simultaneously. By moving the sliding frame N upward the side sections of the twisters that are located in the sliding frames are forced upward correspondingly, and the side sections J of the twisters in the sliding frame M are forced downward with the frame by the same movement of the lever. Thus the section 1 of the upper twister, C, which has one of the weft-wires 16, will be carried down and brought on a line to coincide with the central section of the twister D. By the same vertical movement of the sliding frames M N the twister-heads 5 and 9 are carried down opposite to the central section, L, of the twisters F and H, and the twister-heads 4, 8, and 12 are carried up opposite to the central sections of the twisters D, F, and H, one twister receiving one of the side sections from the adjoining twister and giving one of its own side sections to the said adjoining section. (See Figs. 8 and 9, and compare the same with Figs. 12 and 2.) The blank inactive twisters I I′ are thus caused to register with the central section, L, of twisters C I and the blank sections of twisters C I are reversed, as is obvious. In this manner the side sections, J K, which have weft-wires 16 passed through them, coincide with the twisters D, F, and H, which originally had the side sections without any weft-wires. While the machine is in this condition, with its weft-wires all located at the twisters D F H, the crank O′ is turned, causing the rotating of all of the twisters simultaneously as they are geared together for instantaneous operation. The number of complete turns given to the twisters will regulate the number of twists which are made in the wires.

As the twisters are geared together, one twister will turn in one

direction and the adjacent twister will turn in the opposite or reverse direction; but at the same time each twister will make the proper twist on the two weft-wires without interfering with each other.

It will be understood that the throw or movement of the sliding frames M N is just sufficient to cause the side sections to align or coincide with the central section of the twisters above and beneath the same, according to the direction in which the side sections are moved by the sliding frames. In turning the twisters to make a complete twist, it is necessary to completely revolve the twisters—that is, transfer one side section from the sliding frame M to the sliding frame N, and then return it again to the frame M. This turning of the twisters is kept up to correspond with the number of twists to be made at the crossing of the wires. When the twisting is completed at this point, the sliding frames are shifted back to their original positions by properly manipulating the hand-lever, thus returning the side sections, J K, to their proper central sections. The weft-wires are now located as follows: The single weft-wires at the twisters 1 and 12 extend alongside of the warp-wires 15. The double weft-wires at the twisters 4 5 and 8 9 are arranged on each side of their respective central sections, C E, and while in this position the crank is again turned to cause the rotation of the twisters and consequent twisting of the wires at the points designated. The single end weft-wires twist around the warp-wires and the double weft-wires twist upon themselves or around each other. Having now reached the point from where the operation started, it is not necessary to continue further, since by repeating the operation over and over again the wires are inclined and twisted to form additional meshes or loops of the netting, as will be very readily understood. It will be plain that by the alternate shifting of the sliding frames M N up and down the weft-wires are extended down and up in alternate series, and thus woven together to form the mesh when the twisters are rotated.

I illustrate another style of fence in Fig. 11, and I will proceed to describe the manner of weaving the wires. In this form of fence I use the warp-wires at each of the several central sections of the twisters, and pass the woof-wires through the side twister-heads, 2, 3, 6, 7, 10, and 11, as shown in Fig. 10; or they may be passed through the heads 1, 4, 5, 8, 9, and 12, which will produce the same result. The manner of threading the twisters is shown in Fig. 10, and it differs from Fig. 2 only in having the warp-wires through all of central and through the side twister section-heads, as in Figs. 1 and 2—*i. e.*, through numbers 2, 3, 6, 7, 10, and 11. It will be understood that the weft-wires in the style shown in Fig. 11 twist around the warp-wires, which are held straight and tight.

Referring to Fig. 12 will be seen the arrangement of the wires when constructing the style of fence shown in Fig. 13. Warp-wires are used at the top and bottom twisters, and the weft-wires are passed through both side sections of all the twisters, except the top and bottom ones, which latter have only one weft-wire. By operating the slides M N of the machine the adjacent weft-wires are

caused to cross each other, but not twist, at the points z^1, the twisting being made at the point on the weft-wires reached when the slides come to the limit of their movements, as before explained. The weft-wires cross at the point z^2 when about half of the movement of the slide has been made.

Referring to Fig. 15 will be seen another style of fence, which is, however, very similar to the plan shown in Fig. 13. The threading of the wires in the twisters to form the plan of fence seen in Fig. 15 is shown in Fig. 14. The arrangement of the weft-wires is the same as in Fig. 13, but the plan of the warp-wire is different, in the fact that in Fig. 14 all of the twisters have the warp-wires. It will be seen that the weft-wires cross each other at an intermediate point before twisting around the warp-wires, just as in Fig. 13. At the end of each movement of the slides the twisters are rotated to effect the twisting of all the weft-wires around the warp-wires. The plan of fencing shown in Fig. 15 makes a very strong fence, the meshes being close together and the arrangement and connection of the warp and weft threads mutually bracing each other, and thus avoid any liability to sag.

The style of fence shown in Fig. 16 is made by threading the central sections of the twisters at the upper and lower side of the machine, C I, with large wire 15, then the central section of the twisters D E F G H with either large or small wire 16, and finally the twister-heads 2, 4, 6, 8, 10, and 12, as shown in Fig. 16, with small wire from the bobbins R. The sliding frames are now shifted and the twisters are rotated, after which the frames are returned to their former position, the same as in the operations hereinbefore referred to.

To make the style of fence shown in Fig. 17 of the drawings, the central sections, L, of the twisters C, E, and I, are threaded with the large warp-wires 15, and the heads 1 4 5 6 7 8 9 10 11 12 of the side sections, J K, are threaded with the small weft-wire 16 from the spools R, after which the sliding frames are shifted, the twisters rotated, and the frames returned to their normal position, as hereinbefore described. The mesh of the fabric shown in this figure is very wide at the top or upper half, and at the lower half it is very close to prevent small animals from passing through the lower part, as may be desired in some cases, and it also produces a very ornamental and pretty fence.

Fig. 18 shows another plan of fencing made by my machine, in which I employ pickets or slats, as shown. The threading of the twisters to make this form of netting shown in this figure, and the operation, are exactly the same as represented in Figs. 12 and 13. The palings or pickets are introduced by hand through the meshes of the wires as each mesh is completed.

Fig. 19 illustrates the common form of wood fence held together by wires. In this instance as many of the twisters are threaded with their side sections as will accord with the desired number of strands for the fence; but the central sections, L, have no wires passed through the opening at the front end thereof. It will be seen that the central and side sections of the twister have slots or

openings. The wires for the side sections in this instance are passed through the central shaft or spindle of the central section; then they are separated, and one wire is passed through one side section and the other wire through the other side section. In this instance warp or larger wires only are used from the rolls or bundles in rear of the machine, and no woof-wires are fed from the spools R on the movable sections of the twisters. In making this style the sliding frames M N remain inactive. The twisters are rotated in first one direction and then the other to twist or weave the wires between the slats or pickets in a straight line, the pickets being introduced by hand, of course.

In Fig. 20 I have shown still another form of fence that my machine is capable of making. In threading the machine for this style each alternate central twister is threaded, C, E, G, and I, with the warp or large wires, and the heads 1, 2, 3, 4, 5, 8, 9, 10, 11, and 12 are threaded with the small or woof wire, after which the slides and levers are operated in the manner hereinbefore described to form the twists and meshes of the fabric.

It will be observed that I provide a simple and strong machine which is capable of doing a variety of work without adjusting or changing any of its parts. The machine has very few parts when the character of the work to be performed thereby is taken into consideration, and the arrangement of the parts is such as to avoid the possibility of the machine getting out of working order.

I may either construct a portable machine, as shown in the accompanying drawings, to work in the open field or other place, or dispose the parts in a horizontal instead of a vertical position and mount the same on suitable bearings and legs to provide a stationary machine for indoor use.

I do not wish to be understood as confining myself to the exact details of construction and form and proportion of parts herein shown and described as an embodiment of my invention, as I am aware that numerous changes therein can be made without departing from the spirit or sacrificing the advantages of my invention.

Having thus fully described my invention, what I claim as new, and desire to secure by letters patent of the United States, is—

1. In a wire-fabric machine, a series of sectional twisters, each of which comprises a central section for carrying a warp-wire, and having rotary movement imparted thereto, and the shifting sections for carrying the weft-wire, and receiving rotary motion from the central section to form the twist, substantially as and for the purpose herein described.

2. In a wire-fabric machine, the combination of a series of sectional twisters geared together for simultaneous rotation, and each comprising a central portion movable only on its axis and side portions capable of a compound movement—that of rotation on their axes—and of a shifting longitudinal movement, substantially as described, for the purpose set forth.

3. In a wire-fabric machine, the combination of a series of sectional twisters, comprising the central section having rotary movement imparted thereto to rotate the same on its axis only, the shift-

ing side sections adapted to align with the central sections to be rotated thereby, and mechanism for shifting the said side
541 sections to cause the side section of one twister to coincide with the central section of the adjacent twister, substantially as described, for the purpose set forth.

4. In a wire-fabric machine, the combination, with the series of sectional twisters, of the shifting frames carrying the movable sections of the twisters, the central section of the twisters being held from longitudinal movement during the shifting of the frames, and the side sections being carried by the frames to cross the wires, the side sections being rotated by the central sections, substantially as described, for the purpose set forth.

5. In a wire-fabric machine, the combination, with the sectional twisters, comprising the central sections capable of rotating-movement on their axes only, and the side sections having longitudinal movement and rotated by the central sections, of the shifting frames carrying the said side sections, which are capable of free rotation therein, substantially as described, for the purpose set forth.

6. In a wire-fabric machine, the combination of the sectional twisters, comprising the central section having the projecting heads, and the side sections fitted against the central section, and the sliding frames in which the side sections are carried and are capable of free rotation, substantially as described, for the purpose set forth.

7. In a wire-fabric machine, the sectional twisters, comprising the central and side sections movable with respect to each other, the sliding frames movable in opposite directions simultaneously and carrying the side sections therewith, and means for shifting the said frames, substantially as described, for the purpose set forth.

8. In a wire-fabric machine, the sectional twisters, comprising the central and side sections, in combination with the sliding frames having the recesses in which the side sections of the twisters are fitted, and a lever connected with the slides for moving them in opposite directions simultaneously, substantially as described.

9. In a wire-fabric machine, the series of sectional twisters, comprising the central and side sections, the central section of each twister being geared to the twister adjacent thereto for simultaneous operation, substantially as described, for the purpose set forth.

10. In a wire-fabric machine, the combination of a series of twisters geared directly together for simultaneous operation, and each comprising a central section and the side section, each side section carrying a spool or reel for the wire, substantially as described, for the purpose set forth.

11. In a wire-fabric machine, a series of twisters connected for simultaneous operation, and each consisting of a central section and the side section, in combination with the spools carried by the side sections, the central section of each twister being provided with a longitudinal opening for the passage therethrough of the warp-wire, substantially as described.

12. In a wire-fabric machine, the combination of a carrying-frame, the sliding frames therein, the sectional twisters having the stationary central section and the side sections fitted in the sliding frames, and

means for moving the carrying-frame with a step-by-step motion, substantially as described, for the purpose set forth.

13. The combination of a series of twisters geared directly together, and each consisting of a central section capable of rotation on its axis only, and the side sections, the oppositely-movable slides in which the side sections are fitted, the spools carried by the side sections, and a lever for shifting the slides simultaneously, substantially as described.

14. The combination of a series of sectional twisters, each consisting of a central section having the projecting heads, and the side sections in contact with the central section and having the segmental heads with their flat sides in contact with the heads of the central sections, the said heads of the central and side sections forming a complete circle when the sections are placed together side by side, substantially as described, for the purpose set forth.

15. In a wire-fabric machine, the combination of a series of rotary twisters geared directly together for simultaneous operation, each twister having a central section capable of rotary movement only, and two side sections which are capable of a shifting movement independently of the central section in opposite directions simultaneously, whereby the said shifting sections of one twister are adjusted to register with the central sections of twisters on opposite sides of the same, substantially as described, for the purpose set forth.

16. In a wire-fabric machine, the combination of a series of rotary twisters geared together for simultaneous operation, each twister comprising a central section capable of rotation on its axis only, and the shifting sections arranged on opposite sides of the central section, each side section having segmental heads which impinge upon the central section when the twister is rotated, substantially as described, for the purpose set forth.

17. In a wire-fabric machine, the combination of a series of rotary twisters, each of which consists of two shifting sections capable of movement in opposite directions simultaneously, and a central section having rotary movement imparted thereto and interposed between the shifting sections to impinge upon the latter when they align therewith and rotate the same, substantially as described.

18. In a wire-fabric machine, the combination of a series of rotary twisters, each of which consists of a central section held from endwise movement and capable of rotation on its axis only, and
542 & 543 the side sections capable of shifting movement in opposite directions simultaneously, the side sections of one twister being arranged on opposite sides of the central section thereof and impinging upon the latter to be rotated on their axes therewith, the twisters being capable of rotary movement only when the shifting side sections thereof are in line with the central section, substantially as described, for the purpose set forth.

19. In a wire-fabric machine, the combination of a series of rotary twisters, each twister comprising the shifting side sections provided with the segmental heads, through which the warp-wires are to be passed, and the central section disposed between the side sections and held from shifting movement, the central sections of the series of

twisters being geared directly together and impinging upon the side sections when the latter are in line therewith, to rotate the said side sections, substantially as described, for the purpose set forth.

20. In a wire-fabric machine, a series of sectional twisters, each comprising a central section, the central sections being geared together to be simultaneously rotated on their axes, and the shifting side sections adapted to align with the central sections to be rotated therewith, substantially as described, for the purpose set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in presence of two witnesses.

ALVA L. KITSELMAN.

Witnesses:

JAMES W. McCAMISH.
HENRY P. KITSELMAN.

551 United States Patent Office.

THEODORE M. CONNER, of Richmond, Indiana, assignor of part to Thompson M. Conner and John B. Dougan, both of same place.

Machine for Forming Netted Wire Fabrics.

Specification forming part of Letters Patent No. 357,067, dated February 1, 1887. Application filed October 23, 1886. Serial No. 217,080. (No model.)

To all whom it may concern:

Be it known that I, Theodore M. Conner, a citizen of the United States, residing at Richmond, in the county of Wayne and State of Indiana, have invented new and useful improvements in machines for forming netted wire fabrics, of which the following is a specification.

My invention relates to mechanism for producing netted wire fabric; and the purpose thereof is to provide an apparatus having continuous positive movement in which the marginal wires may be introduced at different points to form netting of varying width, and in which the wires forming the netting pass from the spools in parallel lines, and are intersected by the travel of the spool-carriers, thereby forming the successive reticulations without the employment of other mechanism than the traveling spool-carriers.

It is also the purpose of my invention to so construct and organize said apparatus that it may be used in the formation of two distinct series of reticulations, the intersections of the one being intermediate of those of the other, thereby producing a double net with parallel filaments.

It is my further purpose to combine with the netting apparatus mechanism whereby the formed web may be advanced successively, the rate of speed being adjustable, whereby the size and relative form of the net-spaces may be varied to adapt the fabric to special uses.

My invention consists in the several novel features of construction and combinations of parts hereinafter fully set forth, and definitely pointed out in the claims following this specification.

(Here follow diagrams marked pp. 544, 546, 548, and 550.)

(No Model.) 4 Sheets—Sheet 1.

T. M. CONNER.

MACHINE FOR FORMING NETTED WIRE FABRICS.

No. 357,067. Patented Feb. 1, 1887.

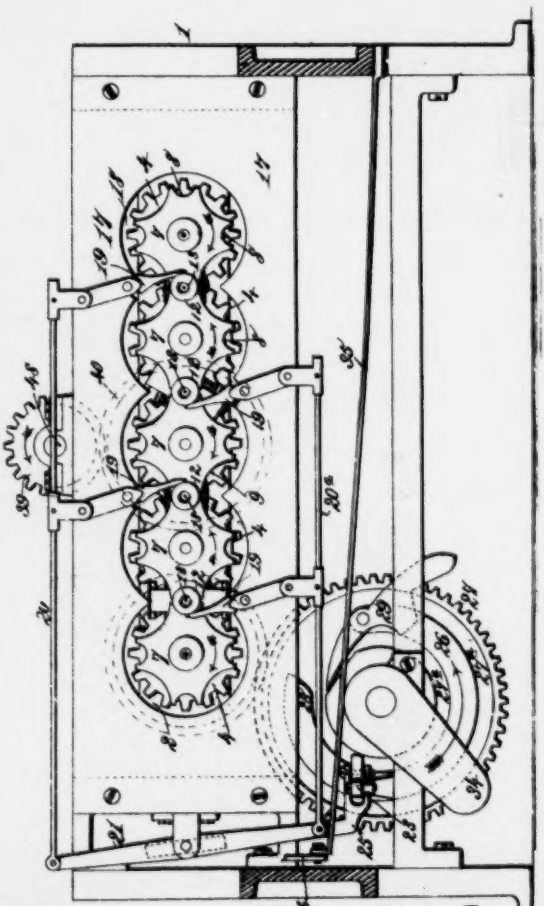

Fig. 1.

Witnesses.
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J. A. Rutherford

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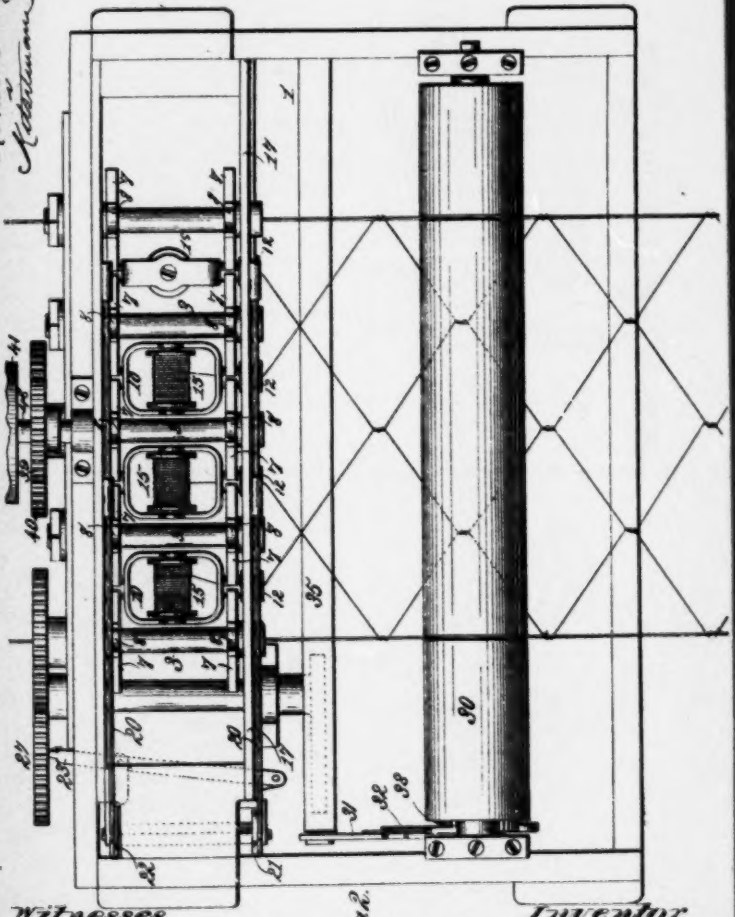
Theodore M. Conner.
By James L. Norris.
Atty.

(No Model.) 4 Sheets—Sheet 2.

T. M. CONNER.

MACHINE FOR FORMING NETTED WIRE FABRICS.

No. 357,067. Patented Feb. 1, 1887.



Witnesses.
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Fig. 2.

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(No Model.) 4 Sheets—Sheet 3.

T. M. CONNER.

MACHINE FOR FORMING NETTED WIRE FABRICS.

No. 357,067. Patented Feb. 1, 1887.

Fig 3.

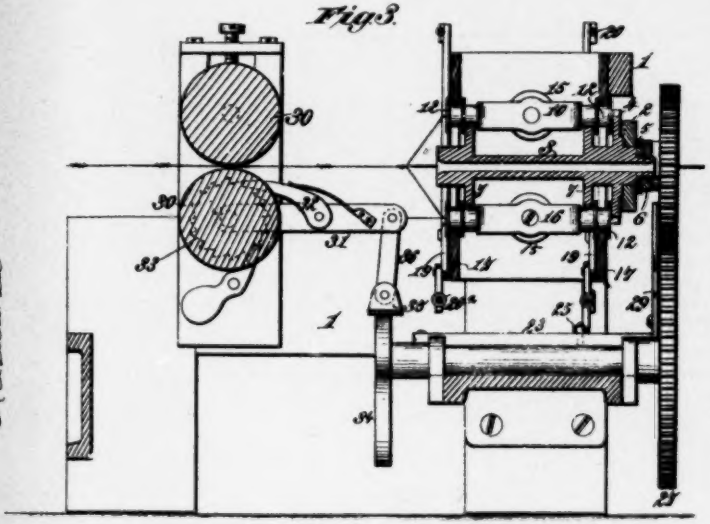


Fig 4.

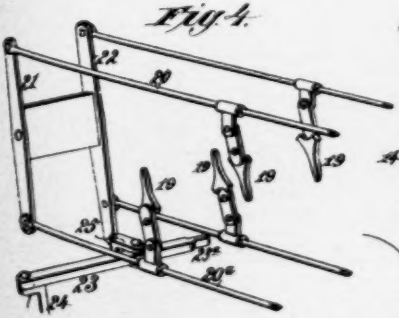
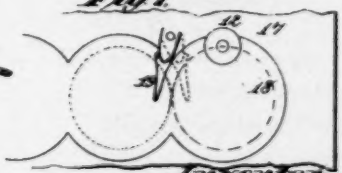


Fig 5.

Fig 6.

Fig 7.



Witnesses.
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(No Model.) 4 Sheets—Sheet 4.

T. M. CONNER.

MACHINE FOR FORMING NETTED WIRE FABRICS.

No. 357,067. Patented Feb. 1, 1887.

Fig. 8.

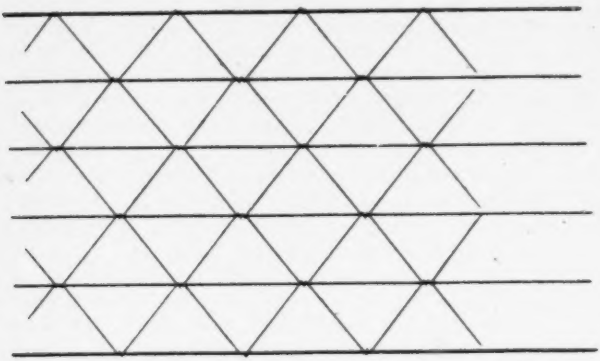
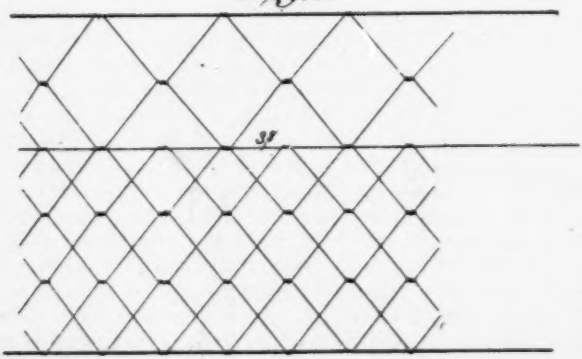


Fig. 9.



Witnesses
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Referring to the drawings forming part of this application, figure 1 is a section taken transversely to the line of feed of the machine. Fig. 2 is a plan view. Fig. 3 is a vertical section taken in the line of feed of the machine. Fig. 4 is a detail perspective showing the switch-actuating devices. Fig. 5 is a detail perspective of one of the spool-carriers. Fig. 6 is a detail section of one of the spool-carriers with the spool in place. Fig. 7 is a diagram showing the course of the spool in the process of forming the net. Fig. 8 is a view of one form of netting produced by this machine. Fig. 9 is a view of a form of net produced by the same mechanism.

In the said drawings, the reference-numeral 1 denotes the frame of the machine, within which the operative parts are journaled. Within a strong plate, 2, mounted upon the frame and extending from side to side thereof, are mounted a series of hollow shafts, 3, each having an equal gear, 4, intermeshing with the adjacent gears upon each side. The shafts 3 are mounted within the plate by means of washers 5 and nuts 6, lying outside the support, while the gears 4 lie upon the inner face of the plate 2, each shaft having support at one end only. Near the gear 4, upon each shaft, are mounted rigidly two spool-carrying disks, 7, having notches or semicircular seats 8, as shown in Figs. 1 and 5, one of said disks being placed near the free or unsupported end of the shaft and the other near the opposite end. The entire train of gears is driven by a master-gear, 9, mounted upon a prolongation of one of the shafts 3, and revolved by power from any suitable source. The number of the shafts 3 may be practically without special limit, though I have shown in the drawings five only.

The numeral 10 denotes what may be termed a "spool" or "bobbin" frame, consisting of an oblong frame having at each end cylindrical bearings 11, adapted by their size to lie within the seats 8 of the disks 7. Each frame is also provided with flanged friction-rolls 12, mounted just outside the bearings 11, and through the journal at one end of the carrier-frame is formed an eye or opening, 13, within which the wire 14 lies as it passes from a spool, 15, mounted in bearings 16 upon the sides of the spool or bobbin frames.

Upon the frame of the machine, in the same vertical planes with the friction-rolls 12, are rigidly mounted guide-plates 17, parallel with each other and having intersecting circular openings 18, which are concentric with and of somewhat greater diameter than the notched disks 7. As the latter revolve, the spool-frames 10, 552 lying in the notches or seats 8, are supported by the curved edges of said plates, as shown in Figs. 1 and 3. Upon the face of each plate are pivotally mounted switches 19, by the action of which the spool or bobbin frames are at intervals withdrawn from the seats 8 in the one pair of disks and lodged in the seats or notches of the adjacent and oppositely-revolving disks, whereby the spools are caused to traverse a path which corresponds to the form of a figure 8. These switches are thrown by connecting-rods 20, operated by a centrally-pivoted lever, 21, to which the switch-rods are connected at or near their ends. The plates 17 are each provided with switches having similar arrangement and action, each consisting of

a metallic point resembling a spear-head pivoted at the intersection of the circular openings in the plates 17, two of said switches being placed above and two below in alternate order. The lever 21 actuates the switches on one plate, and a similar lever, 22, rigidly connected to it, operates those upon the other plate, the upper switches being moved by the connecting-rods 20, and the lower ones by similar rods, 20*, pivoted to the lower extremities of the levers. Automatic action is produced by means of a lever, 23, pivoted to a rigid support, 24, and coupled by a fork, 25, to the lower end of the lever 21. The free end 23* of this lever runs in a ring-cam, 26, (see Fig. 1,) driven by a gear, 27, operated by one of the train of gears 4. The ring-cam is double, or, in other words, consists of an outer and an inner cam, 27* and 27*. Upon the extremity of the lune 28, which composes the cam-surfaces, is pivoted a dog, 29, by which, as the lune revolves, the free end 23* of the lever 23 is carried alternately from the inner to the outer surface of the lune, and *vice versa*, thereby imparting vibration at regular intervals to the lever 23 and reciprocating the switch-rods.

In front of the plates 19, and separated from them by a suitable interval, are feed-rolls 30, one of which receives at each revolution of the power-shaft a partial revolution. This feed is given by a lever, 31, pivoted upon the journal of the roll, and carrying a pawl, 32, which takes into the teeth of a ratchet, 33, rigid on the roll-shaft. This lever 31 is vibrated by a cam-foot, 34, which rises against and lifts a lever, 35, pivotally mounted at one end on the frame, and linked at the other end to the lever 31 by a connection, 36. The marginal wires of the net pass between these rolls, as shown in Fig. 2, and are advanced at reguar intervals a distance necessary for the formation of the web. The operation of the mechanism thus described is as follows: The spools 15, being filled with wire of proper caliber, are placed within the spool-frames 10, and the ends of the wires are drawn through the openings 13, as shown in Fig. 6. The spool-frames are then placed in the seats 8 of the disks 7, substantially in the manner shown in Fig. 1. The marginal wires 37 are then inserted within the hollow shafts 3, preferably in the shafts at the two ends of the train of gears, as shown in Fig. 2, although this arrangement may be varied and the marginal wires inserted in the shafts next to the outer ones, and thereby used to form a netting of less width. The ends of the wires are drawn through far enough to permit their introduction between the feed-rolls 30, and the apparatus is then set in motion. The spool-frames 10 are by the revolution of the disks 7 carried around the circle described by the seats 8 in the said disks, and after a given number of revolutions each frame is withdrawn from the disk in which it rests, and lodged in the seats of the adjacent and oppositely-revolving disks, by which it is caused to describe a similar number of revolutions, after which it is returned to the original position. This gives to each spool-carrier a travel in the path of a figure 8, the adjacent disks crossing each other's path at each revolution, and thereby forming the net or loop in the wire, and afterward producing a twist at such point, having as many turns as the spools make distinct revolutions after the wires

ures. The path of the spool is clearly shown in Fig. 7, the broken line showing the initial movement by which the wire is looped around the marginal wire, which is fed through the hollow shaft on which the spool at the right hand of Fig. 7 is carried. The dotted line in the adjacent disk shows the path taken by the spool after the switch has been operated to bring it into the position shown by dotted lines, thereby transferring said spool to the next disk.

Wires similar to or of less caliber than the marginal wires may be introduced into the shafts of the intermediate carriers, thereby producing a fabric similar to that shown in Fig. 8; or any number of such wires may be used less than the whole number of intermediates. For example, a single straight intermediate wire may be used, as shown at 38, Fig. 9.

Again, additional spool-frames may be introduced in the revolving disks in the vacant seats 8, and these will work out a distinct series of reticulations, which will intersect the series shown in Fig. 8 or in the upper part of Fig. 9. By variations in the arrangement of these parts, and in the number of straight intermediate wires employed, a variety of patterns may be produced on the same machine.

It will be seen that as the disks 7 revolve, the flanged friction-wheels 12 engage with the concentric curved edges of the guide-plates and retain the frames in the seats of the disks.

At each revolution of the gear carrying the ring-cam 27 and 27ª the feed-rolls 30 are revolved a distance which may be varied according to the throw of the cam 34 acting upon the lever 35. By obvious changes the machine may be geared up to give a greater or less number of twists in the net intersections between each feed.

553-555 As already indicated, the width of the net may be varied indefinitely by either extending the train of gears or by introducing the marginal wires in the intermediate hollow shafts, instead of at the ends of the series. When this is done, the spools should be removed from the disks outside the marginal wires.

The machine is driven from a power-shaft, 48, Fig. 1, upon which is a gear, 39, meshing with a gear, 40, upon one of the shafts 3. A pulley, 41, may be mounted upon the power-shaft 48, as shown in Fig. 2. The gear 39 and its shaft appear in Figs. 1 and 2, but have not been shown in the other figures.

What I claim is—

1. In mechanism for forming netted wire fabric, the combination, with a train of oppositely-rotating spool-carrying disks carried in pairs upon shafts arranged in line, each disk having notches or seats 8, of spool or bobbin frames having journals resting in said notches, friction-rolls mounted upon the prolonged ends of said journals, guide-plates having intersecting openings, with the edges of which said friction-rolls engage, and automatic switches by which the frames are at intervals withdrawn from the notches of one pair of disks and carried into those of the adjacent oppositely-rotating disks, substantially as described.

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2. The combination, with a train of intermeshing gears arranged in line, each gear having a hollow shaft, of notched spool-carrier disks mounted on said hollow shafts, bobbin-frames mounted in said notched disks, and automatic switches by which the bobbin-frames are simultaneously withdrawn from the notches of those disks having similar rotation and lodged in the notches of the adjacent oppositely-revolving disks, substantially as described.

3. The combination, with a train of intermeshing gears of equal diameter, mounted on prolonged hollow shafts arranged in line, of a corresponding series of spool-carriers mounted on said hollow shafts and having notched disks, bobbin-frames having journals lying in the notches of said disks, and switches by which the bobbin-frames are each withdrawn from the notches in one pair of disks and lodged in the notches of the adjacent oppositely-revolving pair of disks, substantially as described.

4. The combination, with a series of carriers driven by a train of intermeshing gears and a series of bobbin-frames actuated by the same, of switches operated automatically by means of a double ring-cam, a lever having a dog running in said cam, and a shifter pivoted at the mouth of the ring to throw the dog from the inner to the outer cam-surface, substantially as described.

5. The combination, with a train of notched spool-carrying disks arranged in pairs, driven by intermeshing gears, of bobbin-frames having journals resting in the notches of said disks, plates having curved edges lying near the path of each of said journals as the carriers revolve, and switches which withdraw the bobbin-frames from the notches of one pair of disks and lodge them in the notches of the adjacent oppositely-revolving disks, said notches being thrown by connecting-rods operated by levers 21 and 22, the latter having connection with a lever running in the cam-race of a wheel, 27, substantially as described.

6. The combination, with a series of hollow shafts arranged at regular intervals and in parallelism, of notched spool-carrying disks arranged in pairs upon each shaft, bobbin-frames having journals which lie in the notches of said disks and are pierced to permit the passage of the wires from the bobbins, a series of switches to withdraw the journals of said frames from the notches of the alternate disks and lodge them in the notches of the adjacent and oppositely-revolving disks, and a series of intermeshing gears driving said hollow shafts, substantially as described.

7. The combination, with a series of revolving spool-carrying disks driven by intermeshing gears, of a series of spool or bobbin frames having journals or supports lying in seats in said disks, friction-rolls mounted on the projecting ends of the spool-frames, guide-plates having intersecting openings concentric with the path of revolution of the spool-carriers, and switches acting upon the friction-rolls of said carriers to transfer the latter from one pair of disks to the adjacent and oppositely-revolving pair, substantially as described.

8. The combination, with the spool-frames 10, having bearings 11, and provided with an eye or opening, 13, in one of its bearings, of the friction-rolls 12, the disks 7, having seats 8, the hollow shaft 3, plates 17, having openings 18, and a driving-gear, substantially as described.

In testimony whereof I have affixed my signature in presence of two witnesses.

THEODORE M. CONNER.

Witnesses:

RICHARD A. JACKSON.
JNO. R. HALL.

567 United States Patent Office.

WILLIAM J. DAVISSON, of Farmland, assignor of one-half to Jonathan A. Botkin, of Swain's Hill, Indiana.

Machine for Making Wire Fabrics.

Specification forming part of Letters Patent No. 289,507, dated December 4, 1883. Application filed September 8, 1883. (No model.)

To all whom it may concern:

Be it known that I, William J. Davisson, a citizen of the United States, residing at Farmland, in the county of Randolph and State of Indiana, have invented a new and useful improved machine for making wire fabrics, of which the following is a specification.

My invention relates to an improved machine for making that class of wire fabric in which a series of light wires are twisted together to form a net-work of diagonal meshes, and about two straight wires forming the edges of the fabric.

The object of my invention is to provide a machine for the purpose mentioned which shall automatically form a continuous wire fabric having on each edge a straight wire, and consisting of meshes formed by twisting together and about said straight wires a series of wires carried on suitable spools or reels, as hereinafter fully described.

The accompanying drawings illustrate my invention.

(Here follow diagrams marked pp. 556, 558, 560, 562, 564 & 566.)

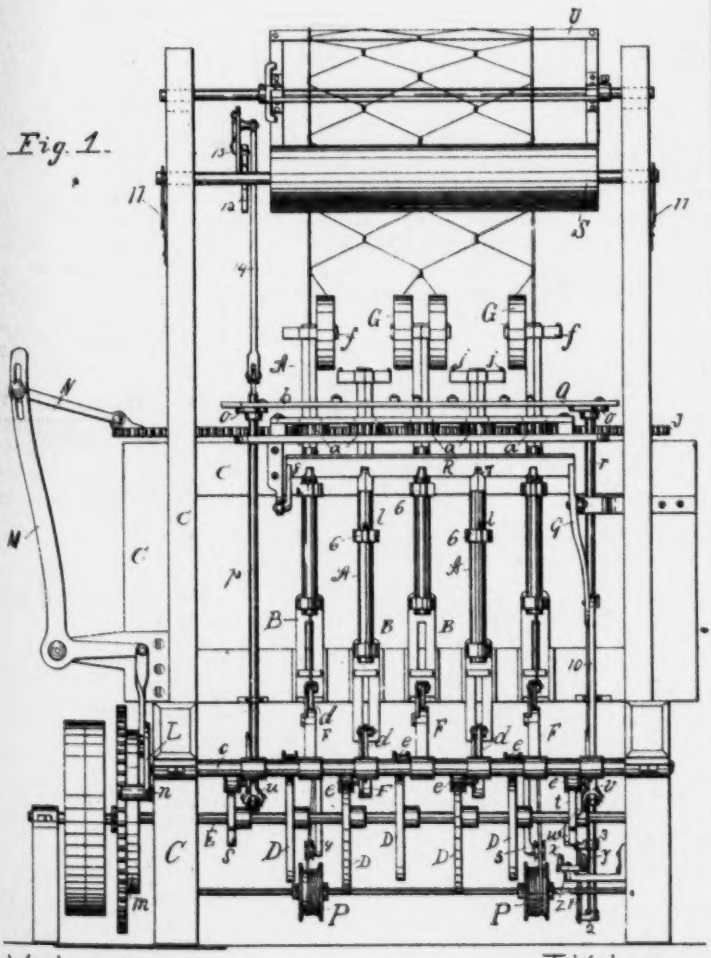
(No Model.) 6 Sheets—Sheet 1.

W. J. DAVISSON.

MACHINE FOR MAKING WIRE FABRICS.

No. 289,507. Patented Dec. 4, 1883.

Fig. 1.



WITNESSES:

A. C. Bowen.
P. P. Hood.

INVENTOR:

William J. Davisson.
By H. P. Hood
Atty.

(No Model.) 6 Sheets—Sheet 2.

W. J. DAVISSON.

MACHINE FOR MAKING WIRE FABRICS.

No. 289,507. Patented Dec. 4, 1883.

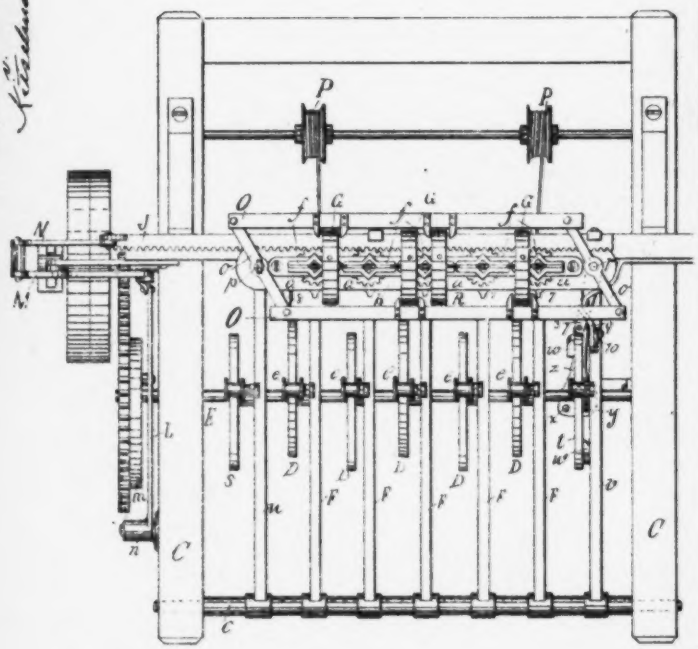


Fig. 2.

WITNESSES.

A. C. Bowers.
C. P. Wood.

INVENTOR:

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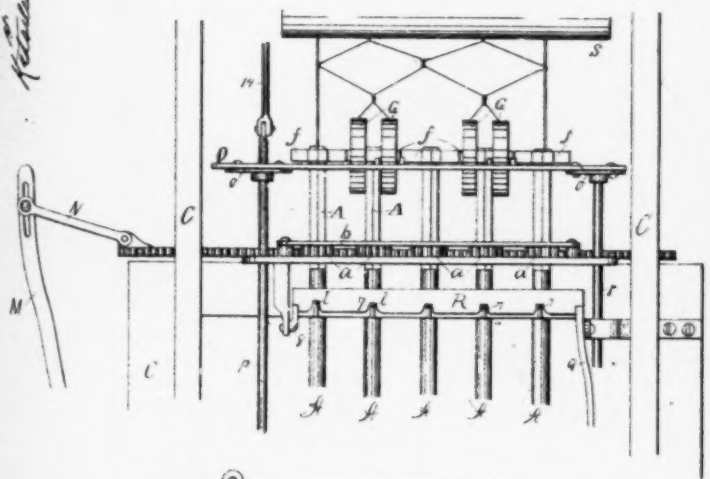
(No Model.) 6 Sheets—Sheet 3

W. J. DAVISSON.

MACHINE FOR MAKING WIRE FABRICS.

No. 289,507. Patented Dec. 4, 1883.

Fig. 3.



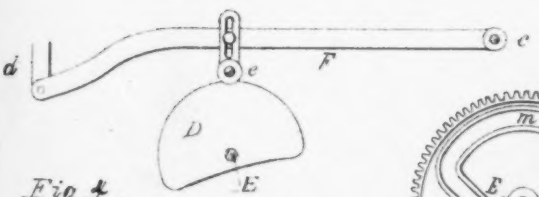


Fig. 4.

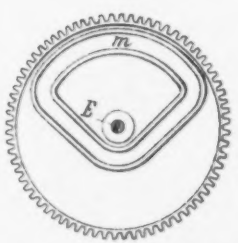


Fig. 5.

WITNESSES:

A. C. Bowen
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INVENTOR:

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(No Model.) 6 Sheets—Sheet

W. J. DAVISSON.

MACHINE FOR MAKING WIRE FABRICS.

No. 289,507. Patented Dec. 4, 1883.

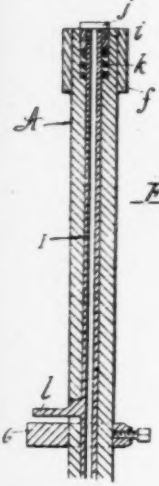

Fig. 6.

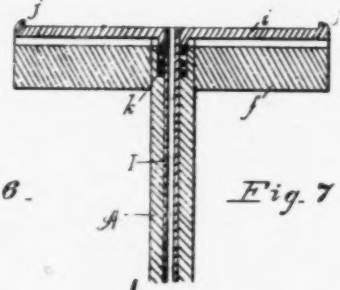

Fig. 7.

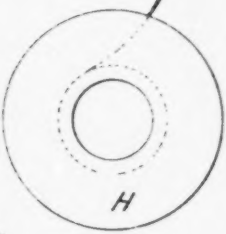

Fig. 8.

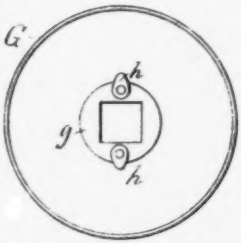

Fig. 9.

Fig. 10.

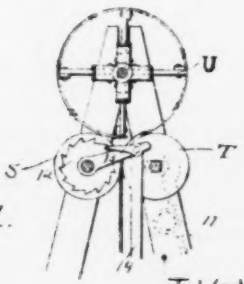

Fig. 11.

WITNESSES:

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(No Model.) 6 Sheets—Sheet 5.

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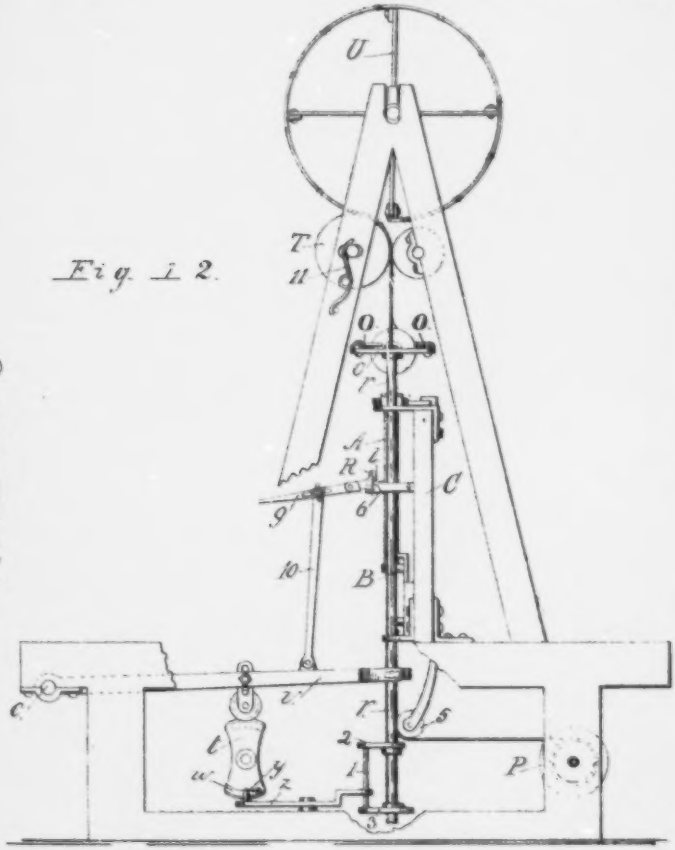
MACHINE FOR MAKING WIRE FABRICS.

No. 289,507. Patented Dec. 4, 1883.

Fig. 12.



No. 1468 Kokomo Co. } p. 564
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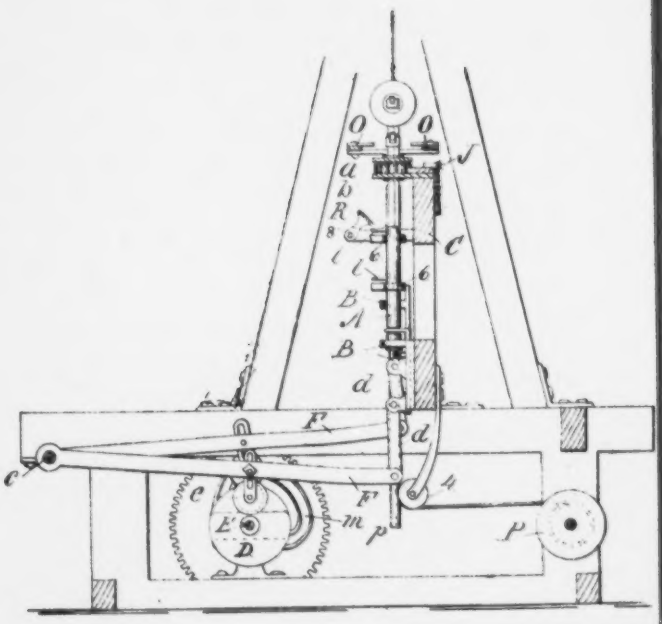
(No Model.) 6 Sheets—Sheet 6.

W. J. DAVISSON.

MACHINE FOR MAKING WIRE FABRICS.

No. 289,507. Patented Dec. 4, 1883.

Fig. 13.



WITNESSES:
Frank. A. Jacob.
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INVENTOR:
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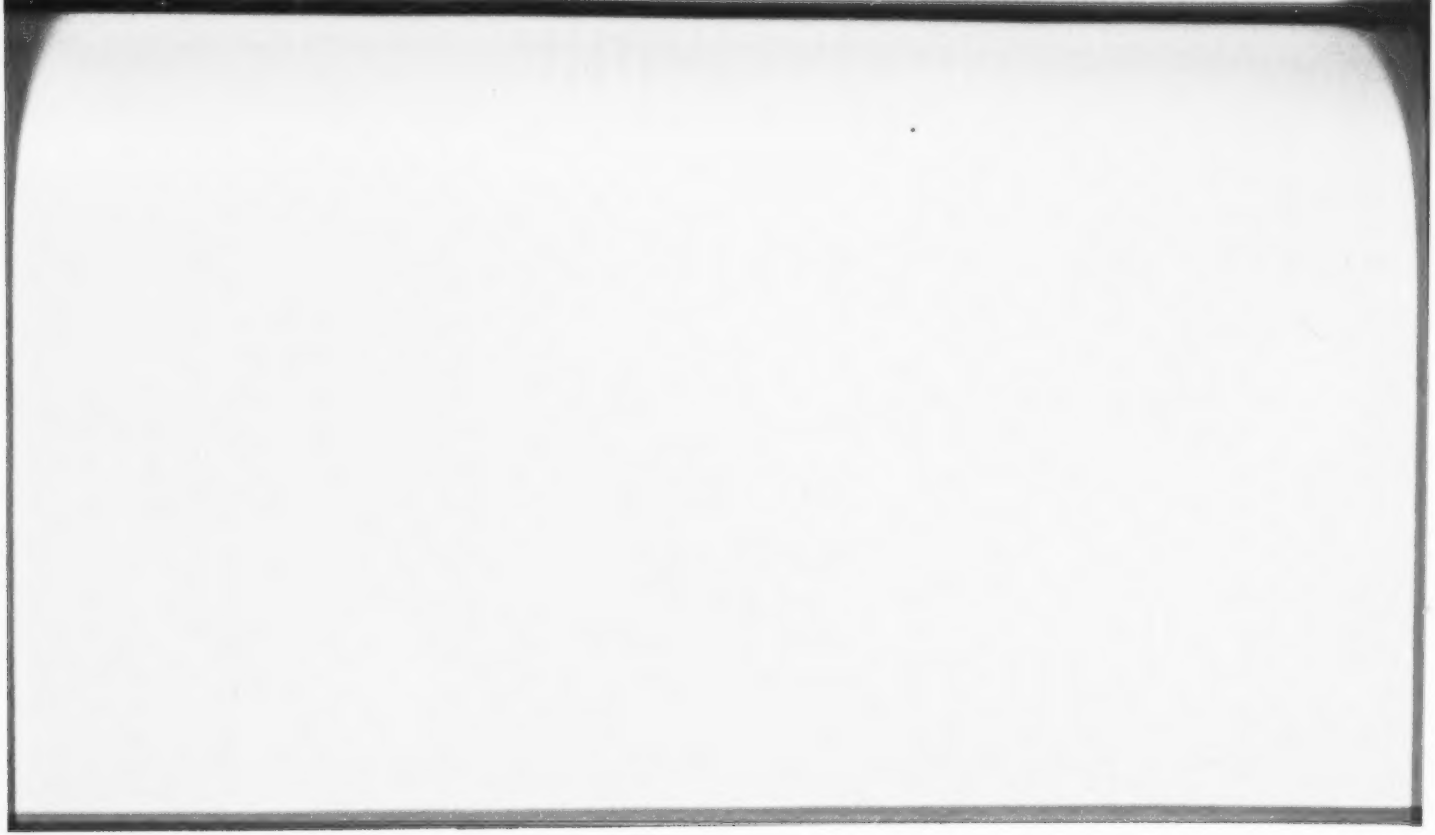

Figure 1 is a front elevation of the entire machine, showing the twisting-spindles and wire-reels in the position for forming the meshes. Fig. 2 is a plan of the same. Fig. 3 is a partial front elevation, showing the twisting-spindles in position for shifting the wire-reels from one set of spindles to another. Fig. 4 is a side elevation of one of a series of cams and levers for lifting the twisting-spindles. Fig. 5 is a side elevation of a cam for operating the twisting mechanism. Figs. 6 and 7 are enlarged sectional views of the twisting-spindles. Fig. 8 is a side elevation of one of the wire-reels. Fig. 9 is a side elevation of one of the reel-cases. Fig. 10 is a vertical section of a reel-case and a wire-reel in position thereon. Fig. 11 is an end elevation of the take-up rolls. Fig. 12 is a side elevation of the machine, looking toward the right-hand side of the machine as shown in Fig. 1. Fig. 13 is a vertical section of the machine, taken on a plane at right angles to the power-shaft.

Like letters indicate the same parts in all the figures.

A series of hollow vertical spindles, A A, having their lower ends journaled in vertical sliding bearings B B, are mounted on a suitable main frame, C C. Each of said spindles is provided at its upper end with a cogged pinion, *a*, which is provided with a projecting cylindrical hub having a bearing in a plate, *b*, secured to frame C. Pinions *a* are each provided with a square central perforation, and the upper end of each of the spindles is squared and fitted to slide freely through said perforation, the purpose being to revolve the spindle by means of the pinion, and to allow a vertical movement of the spindle through the pinion. Each spindle A is given an intermittent reciprocating motion by means of a cam, D, mounted on the driving-shaft E, and a lever, F, pivoted at one end to a rod, *c*, extending across from one side of the main frame to the other, and connected at the free end with the sliding bearing B by means of a short link, *d*. A friction-roller, *e*, is adjustably secured to lever F over cam D, there being a cam and a lever for each spindle. Cams D are placed alternately on the driving-shaft, with their flat faces on opposite sides of the shaft and their high portions overlapping, so that at each half-revolution of the driving-shaft each alternate spindle is raised, as seen in Fig. 1; but on account of the overlapping of the high portions of the cams there are two points in each revolution where the spindles are all at their highest point at the same time, for a purpose hereinafter explained. Across the top of each spindle is secured a square cross-bar, *f*.

G G G G are cylindrical cases formed of sheet metal, having a central hub, *g*, which has a square central hole which fits over and is adapted to slide upon the cross-bars *f*. The cases G are open on one side, and each carries within it a reel, H, which is adapted to turn on hub *g*. The wire for forming the meshes of the fabric is wound upon said reels, and they are prevented from slipping off the hub by turn-buttons *h h*, all as clearly shown in Figs. 8, 9, and 10.

For the purpose of preventing the wire-reels and their cases from being thrown off from the ends of cross-bars *f*, a narrow bar, *i*, having upturned ends *j j*, Fig. 6, is placed in a groove in the top edge of cross-bar *f*, said groove being of such depth that the upturned ends of bar *i* may be drawn down flush with

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the top surface of *f*. Said cross-bar *f* is centrally secured to the upper end of a tube, I, which slides in spindle A. The interior of spindle A is enlarged at the top to receive a spiral spring, *k*, which surrounds tube I and forces the upturned ends of bar *i* above the surface of *f*. A pin, *l*, fastened to the exterior of tube I, projects through a slot in the side of the spindle and stops the upward movement of the tube and the bar *i*.

J is a rack-bar engaging pinions *a a*, and adapted to slide forward and backward endwise, and to revolve said pinions and their respective spindles alternately in opposite directions. Rack-bar J is reciprocated by means of a grooved cam, *m*, on one side of the driving-wheel, (shown clearly in Fig. 5,) a lever, L, pivoted to the main frame at *n*, and having a pin projecting into grooved cam *m*, a bell-crank, M, to the short arm of which the free end of lever L is connected, and a rod, N, pivoted to the end of the rack-bar and adjustably connected to the long arm of lever M.

O O are shipper-bars for shifting the wire-reels from one set of spindles to another. Said bars are pivoted at their ends to cross-heads *o o*, and said cross-heads are rigidly secured at their centers to two upright shafts, *p r*, which shafts are raised twice in each revolution of the driving-shaft by means of cams *s* and *t*, secured on the driving-shaft, and levers *u* and *v*, pivoted at one end to the rod *e*, and connected at the other end with shafts *p* and *r*. Shaft *r*, after being raised, is given a partial revolution by means of cam-shaped projections *w w* on the sides of cam *t*, Fig. 2. Said projections engage alternately pins *x y* on a lever, *z*, the opposite end of which is forked, and engages a rod, 1, secured to shaft *r* by means of two short arms, 2 and 3.

P P are reels carrying the wires for forming the edges of the fabric. 4 5 are guides for said wires.

For the purpose of holding spindles A in position, I secure upon each spindle a dog, 6, and provide a catch-plate, R, which plate is provided with notches 7, adapted to fit over said dogs. Said plate is attached to short arms 8 9, which are pivoted to brackets attached to the main frame. Arm 9 is extended outward beyond its pivot, and is connected with lever *v* by a rod, 10, the effect being, when said lever is raised, to throw plate R downward and engage the dogs on the spindles.

For the purpose of taking up the finished fabric, rolls S T are mounted on shafts journaled in the main frame. The bearings of roll T are movable, and the surfaces of the rolls are held in close contact with the fabric by means of a spring, 11, at each end of roll T. A reel, U, for storing the finished fabric, lies in the slotted bearings on the supports rising from the main frame. One turn of the fabric having been taken about said reel and secured thereto, the reel is thereafter revolved by frictional contact with roll T, on which it rests. Roll S is revolved intermittently by means of a ratchet-wheel, 12, secured to its shaft, a pawl, 13, and a rod, 14, connected to shaft *p*.

The operation of my machine is as follows: The wire from reels P P is carried upward through the outside spindles, A A; or, if a

narrower fabric is desired, it may be carried through either of the other spindles, and four of the incased reels carrying wire for forming the meshes are placed on alternate spindles, as shown in Fig. 1. The wire is led from each of these reels through an opening in the case, and all of the wires are passed between take-up rolls S T and passed once around reel H, and there secured. Power is now applied to the driving-shaft E, and as it revolves rack J is thrown forward and the spindles A are revolved, making two complete revolutions, and thereby twisting together the wires on the opposite ends of the cross-bar *f* on the central spindle and passing the wires on the cross-bars of the outside spindles around the straight wires from reels P P. When these revolutions have been accomplished, the intermediate spindles carrying no reels have been raised by their respective cams D and levers F to the level of the spindles carrying the wires, and catch-plate R has engaged dogs 6, at the same time depressing bars i by striking pins *l* downward. At the same time the shafts *p r* have been raised by cams *s t* and levers *u v*, carrying upward the shipper-bars O O till they are level with the cross-bars *f*, which are now all in line, and the forks of the shipper-bars embrace between them the reel-cases G. The cam projection *w* on one end of cam *t* now passes between pins *x y*, engaging *y*, and lever *z*, being thereby vibrated and engaging rod 1, partially revolves shaft *r*, by this means moving the shipper-bars O O endwise, and thereby shifting the cases G and their reels to the intermediate cross-bars, *f*, which before carried no reels. The spindles first carrying the reels now fall, and those now carrying the reels are revolved by the return of rack J to its first position and a new series of meshes formed. At each upward movement of the upright shaft *p* pawl 13 engages ratchet-wheel 12, and the finished fabric is drawn upward and wound upon reel U.

When short sections of fabric are to be made—as for gates—straight rods may be substituted for the side wires, and the expansible reel removed.

I claim as my invention—

1. A machine for making wire fabric, consisting of the following elements, namely: a series of spindles arranged in a line and mounted in sliding bearings on a suitable supporting-frame, each spindle being provided with a cross-head centrally secured to one end of said spindle, and adapted to carry reels for wire on opposite sides of the axis of said spindle, reels of wire mounted on said cross-heads, means for raising and lowering said spindles at regular intervals and in alternate order, means for intermittingly revolving said spindles at regular intervals, means for locking the spindles in position when their respective cross-bars are in line vertically and laterally, means for retaining the wire-reels upon their respective cross-bars while said cross-bars are revolving, and means for shifting said wire-reels from one set of cross-bars to another, all combined and co-operating substantially as and for the purpose specified.

569–571

2. In a machine for making wire fabric, a series of spindles arranged in a line and mounted in bearings on a suitable supporting-frame, and having on each spindle a cross-head carrying reels for

wire on opposite sides of the axis of said spindle, substantially as specified.

3. In a machine for making wire fabric, two or more hollow spindles adapted to admit the passage through their axes of wires forming the edges of the fabric, and having on each spindle a cross-head carrying reels for wire on opposite sides of the axis of said spindle, substantially as specified.

4. In a machine for making wire fabric, the combination, with hollow spindle A, having a cross-head, *f*, adapted to receive reels for wire, of bar *i*, having upturned ends *f f*, tube I, spring *k*, and pin *l*, substantially as and for the purpose specified.

5. In a machine for making wire fabric, the combination, with a series of spindles, each having a pinion secured thereon, and a cross-head carrying reels for wire on opposite sides of the axis of said spindles, of a rack-bar arranged to intermesh with said pinions, rod N, secured to said rack-bar, levers M and L, and cam *m*, mounted on the driving-shaft E, whereby said series of spindles are simultaneously revolved at regular intervals during each revolution of said driving-shaft, substantially as specified.

WILLIAM J. DAVISSON.

Witnesses:

JOHN A. MOORMAN.
JOSEPH J. PRETLOW.

(No Model.) 2 Sheets—Sheet 1.

J. C. POPE.

WIRE FABRIC MACHINE.

No. 505,607. Patented Sept. 26, 1893.

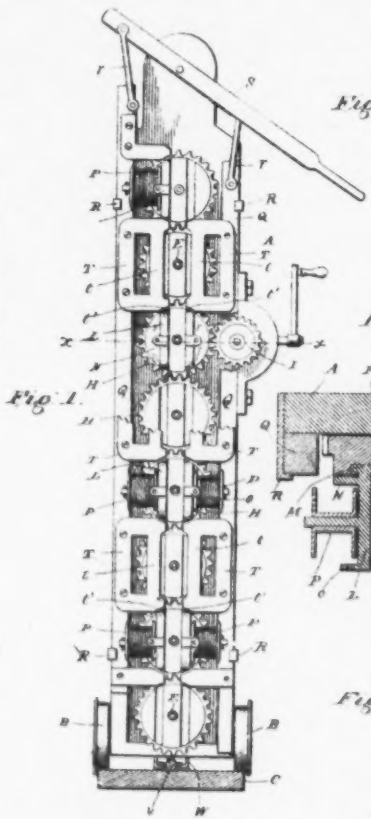

Fig. 1.

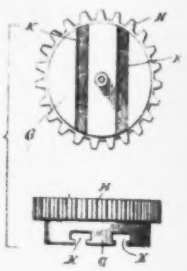

Fig. 4.

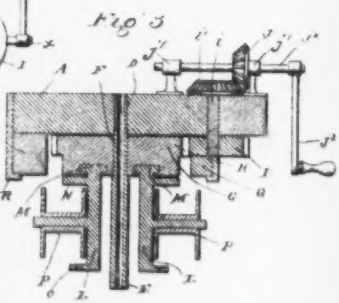

Fig. 3.

Fig. 5.

Witnesses
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D. P. Hollington

Inventor
John C. Pope
by C. A. Snow & Co.

(No Model.) 2 Sheets—Sheet 1

J. C. POPE.

WIRE FABRIC MACHINE.

No. 505,607. Patented Sept. 26, 1893.

Fig 2.

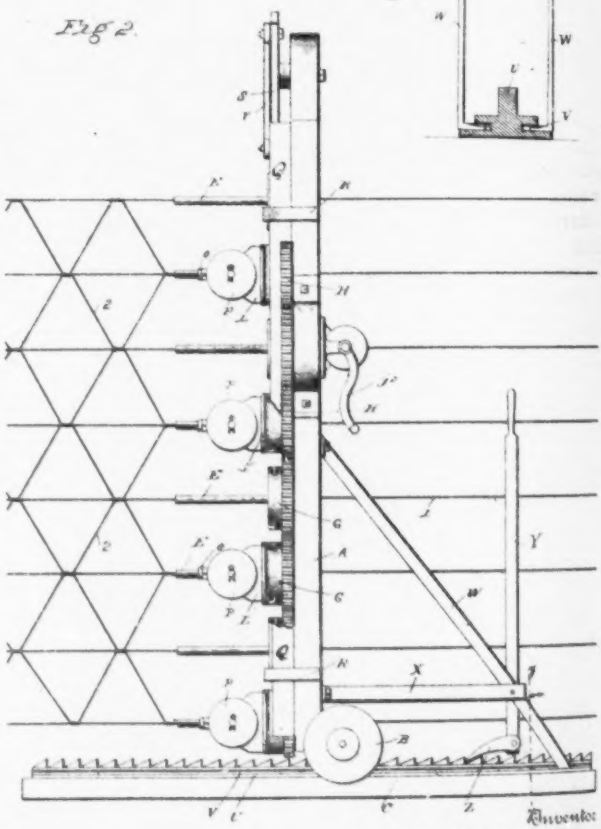
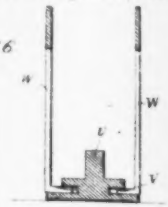


Fig 6



Witnesses
F. H. Johnson
D. P. Hollaniptan

John C. Pope
by C. A. Snow & Co.
Attorneys

575 United States Patent Office.

JOHN C. POPE, of Fox, Illinois, assignor to Alva L. Kitselman and Davis M. Kitselman, of Ridgeville, Indiana.

Wire-fabric Machine.

Specification forming part of Letters Patent No. 505,607, dated September 26, 1893. Application filed May 2, 1893. Serial No. 472,676. (No model.)

To all whom it may concern:

Be it known that I, John C. Pope, a citizen of the United States, residing at Fox, in the county of Kendall and State of Illinois, have invented a new and useful wire-fabric machine, of which the following is a specification.

This invention relates to wire-fabric machines; and it has for its object to provide certain improvements in machines of this character which are specially adapted for being moved along in a straight line, during work, for the purpose of weaving a line of woven-wire fencing.

To this end the main and primary object of the present invention is to simplify the construction of wire-fabric or wire-fence machines, so as to render the same very easily manipulated, while at the same time quite efficient in operation to quickly weave a line of fabric or fencing.

With these and other objects in view which will readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination and arrangement of parts hereinafter more fully described, illustrated and claimed.

(Here follow diagrams marked pp. 572 & 574.)

In the accompanying drawings:—Figure 1 is a front elevation of a wire-fabric machine constructed in accordance with this invention. Fig. 2 is a side elevation partly in section of the same, showing the machine in operative position. Fig. 3 is an enlarged transverse sectional view on the line *x*—*x* of Fig. 1. Fig. 4 is a detail elevation and top view of one of the twister wheels. Fig. 5 is an enlarged detail in perspective of one of the shiftable spool-carriers. Fig. 6 is an enlarged detail sectional view on the line *y*—*y* of Fig 2.

Referring to the accompanying drawings, A represents the upright frame of the machine, supported at its lower end on the opposite flanged traveler wheels B, which are adapted to move on opposite side edges of the stationary ground track C, which will be more particularly referred to as providing means whereby the machine can be easily moved along as the weaving progresses.

The frame A, is illustrated as being a single vertical upright frame piece, which is of a suitable height to adapt it for weaving any height of fence, and is provided with a longitudinal series of regularly spaced threaded openings D, which receive the inner threaded ends of the stationary elongated warp-wire tubes E. The warp-wire tubes E, may of course be secured at their inner ends into the upright frame A, so as to align with the openings or perforations D, therein, and project a distance beyond one side of the frame so as to form guides for the longitudinal line or warp wires 1. The elongated tubes E, which project a distance beyond one side of the frame A, are provided adjacent to such frame with the reduced spindle portions F, which form bearings for the vertical series of intermeshing twister wheels G.

A twister wheel G, is loosly journaled on each of the tubes E, alongside of the frame A for a fixed rotation, and each twister wheel is provided at its inner sides and edges with the cog gear H, which intermeshes with the corresponding gear of the adjacent vertically aligned wheels, so that when one wheel is put in motion, a simultaneous motion will be communicated to every wheel in the vertical series, in order to weave the weft wires onto the longitudinal warp wires.

Motion is communicated to the vertically aligned series of twister wheels G, by means of the small drive pinion I, secured on one end of the counter-shaft *i*, journaled at one side of the frame A, and carrying at its other end the beveled gear wheel *i'*. The beveled gear wheel *i'*, meshes with a corresponding gear *j*, keyed on the shaft *j'*, which is journaled in bearing brackets *j'*, at the rear side of the frame A, and carries at its outer extremity, the crank handle *j*, by means of which the operator turns the twister wheels, in twisting the meeting weft wires around the warp wires or onto each other.

The twister wheels G, are provided in their outer faces or sides, opposite their cog gears, with the parallel rabbeted grooves K, which are arranged on each side of the tubes E, which project through the wheels, and said rabbeted grooves K, are designed to be aligned with the corresponding grooves of the adjacent wheels, in order to provide means for shifting the sliding spool-carriers L,

carried thereby. The sliding spool-carriers L, are single
576 castings having at their inner edges the flanged slide tongues M, which register with the rabbeted grooves of the twister wheels, and are adapted to slide in the aligned grooves, so that the carriers can be shifted from wheel to wheel. The said carriers L, are further provided near their slide tongues with the laterally extended guide or rest flanges N, which are adapted to overlap the outer faces of the twister wheels, and have circular edges corresponding to the circle of the wheels so that the carriers are held in position in each of the wheels, during rotation, as will be more clearly seen in connection with the shifting devices to be presently described, and the said spool-carriers are further provided with the offstanding spool spindles O, and the perforated guide lugs *o*, at their outer extremities, to form guides for the weft wires 2, carried on the wire spools P, which are mounted on the spindles O, and adapted to be shifted with the carriers from twister wheel to twister wheel.

As is well understood by those skilled in the art, during the operation of weaving the weft wires onto the warp wires, every alternate twister wheel is active, and, except when twisting on the top and bottom wires, when there is an uneven number, carry the spools in pairs, so that the weft wires can be either twisted together or onto the warp wires, and after being twisted, these spool-carriers must then be shifted to those twister wheels which were previously inactive, so that the weaving of the fabric or fence may be properly effected.

In order to provide for easily and quickly shifting the spool carrier from one wheel to another, I employ the oppositely moving slide bars Q. The oppositely moving slide bars Q, are held in a sliding position at opposite side edges of the frame A, by means of the flanged guide clips R, secured to opposite side edges of the frame and embracing the outer edges of said slide bars, and to the upper ends of each of said bars are pivotally attached the links *r*, connected to opposite portions of the shifting lever S, pivoted to the top of the frame A, to provide means for easily moving the slide bars up and down.

Fixedly secured to the front faces of each of the opposite slide bars Q, are the oppositely arranged shifting plates T. The shifting plates T, are approximately rectangular in shape and are provided with the adjacent inner side portions *t*, which are adapted to cover or partly cover the slots of the twister wheels which are inactive, and the inner covering side portions *t*, of the shifting plates, terminate at their extremities in the curved shifting edges *t'*. The curved shifting edges *t'*, of the shifting plates, correspond to the curvature of the guide flanges N, of the spool carriers, so that when the active wheels carry the spool carriers around therewith, the said curved shifting edges, of the shifting plates, hold the spool carriers into the shifter wheels, and prevent the same from working into the grooves of the inactive wheels. On the other hand, when the parallel grooves of the entire vertical series of wheels have been brought into perfect alignment with each other, by manipulating the lever S, the shifting plates slide the spool carriers into the adjacent twister wheels, it being apparent that, when shifted, the spool carriers in

one wheel will be shifted into an upper and a lower wheel, respectively.

From the foregoing it will be apparent how a line of wire fabric or wire fence can be easily woven from the machine described, and now returning to the means for moving the machine along as the weaving progresses, it will be seen that the stationary ground track C, is provided with a longitudinal ratchet flange U, at each side of the base of which are formed the longitudinal guide grooves V. The longitudinal guide grooves V, receive the lower flanged ends of the diagonal combined brace and guide arms W, secured at their other upper ends to the frame A, and braced from the same by the offstanding brace bars X. Pivoted between the guide arms W, is the vertical dog lever Y, to the lower end of which is pivoted the gravity dog Z, which engages the ratchet flange U, in order to provide for drawing the machine along the ground to advance the weaving.

It is now thought that the construction, operation, and many advantages of the herein-described wire fencing or fabric machine will be readily apparent to those skilled in the art, and I will have it understood that changes in the form, proportion and the minor details of construction as embraced within the scope of the appended claims may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described my invention, what I claim, and desire to secure by letters patent, is—

1. In a wire fabric machine, the upright frame piece having a series of regularly spaced openings, stationary elongated warp wire tubes fitted at one end in said openings, a vertically aligned series of intergeared twister wheels loosely journaled on said stationary tubes and having parallel face grooves, shiftable spool carriers having tongues registering with the grooves in said wheels, and shifting devices for sliding the spool carriers from one wheel to the other, substantially as set forth.

2. In a wire fabric machine, a vertically aligned series of intergeared twister wheels having parallel rabbeted grooves, and shiftable spool carriers having flanged slide tongues adapted to fit in the rabbeted grooves of said twister wheels, substantially as set forth.

3. In a wire fabric machine, the upright movable frame having a longitudinal series of wire openings, elongated wire
577 & 578 tubes secured at their inner ends in said openings, and provided near the frame with reduced spindle portions, grooved twister wheels journaled on the spindle portions of said tubes and having cog gears intermeshing, and shiftable spool carriers having tongues fitting the grooves of said twister wheels, substantially as set forth.

4. In a wire fabric machine, the frame, a vertical series of elongated warp wire tubes fitted at their inner ends into the frame, a vertically aligned series of intergeared twister wheels journaled on said tubes alongside of the frame and having parallel rabbeted grooves in their outer faces at each side of said tubes, and shiftable spool carriers having flanged slide tongues adapted to fit in said rabbeted grooves, substantially as set forth.

5. In a wire fabric machine, the combination of vertically aligned intergeared twister wheels having rabbeted grooves in their outer faces adapted to be aligned, and shiftable spool carriers having flanged slide tongues adapted to fit in the rabbeted grooves of the wheels, laterally extended guide flanges overlapping the outer faces of the wheels, off-standing spool spindles, and perforated wire guide lugs at their outer extremities, substantially as set forth.

6. In a wire fabric machine, the combination of a series of intergeared twister wheels having parallel grooves in their outer faces, shiftable spool carriers having tongues fitting the grooves of the wheels, and laterally extended curved guide flanges N overlapping the outer faces of the wheels at one side of the grooves therein, and oppositely and vertically moving shifting plates having curved shifting edges adapted to fit the curved guide flanges of the carriers, substantially as set forth.

7. In a wire fabric machine, the upright movable frame, a vertically aligned series of intergeared twister wheels mounted on said frame and having parallel rabbeted grooves in their outer faces adapted to be aligned, shiftable spool carriers having flanged slide tongues fitting the face grooves of the wheel, and off-standing curved guide flanges N overlapping the outer faces of such wheels, oppositely moving slide bars arranged at opposite edges of the frame, and oppositely arranged shifting plates attached to each of said slide bars and having adjacent inner side portions, and curved shifting edges t' at the extremity of said side portions adapted to fit the curved guide flanges of the carriers, substantially as set forth.

8. In a machine of the class described, the combination of the stationary ground track having a longitudinal ratchet flange and longitudinal guide grooves at the base of such flange, the traveling machine frame carrying flanged traveler wheels adapted to move on the opposite side edges of said track, combined brace and guide rods attached to the machine frame and having lower flanged ends fitting said longitudinal guide grooves, and a vertical dog lever pivoted between said arms and carrying a gravity dog adapted to engage said ratchet flange.

9. In a wire fabric machine, the upright frame having openings, stationary warp wire tubes secured to said frame and aligning with the openings therein, a series of aligned twister wheels loosely journaled on said stationary tubes, and shiftable spool carriers mounted to slide on said wheels, substantially as set forth.

10. In a wire fabric machine, the upright frame having openings, stationary warp wire tubes fitted at one end in said openings, a series of aligned twister wheels loosely journaled on said stationary tubes, and shiftable spool carriers having a sliding tongue and groove connection with the twister wheels, substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

JOHN C. POPE.

Witnesses:
JOHN FITZGERALD.
GEORGE F. POPE.

586

United States Patent Office.

JOHN NESMITH, of Lowell, Massachusetts.

Improvement in Machines for Making Wire-netting.

Specification forming part of Letters Patent No. 10,743, dated April 4, 1854.

To all whom it may concern:

Be it known that I, John Nesmith, of Lowell, in the county of Middlesex and State of Massachusetts, have invented a new and useful machine for the manufacture of wire-netting and wire fence by power; and I do hereby declare that the same is fully and clearly described and represented in the following specification and accompanying drawings, letters, figures, and references thereof.

(Here follow diagrams marked pp. 579, 581, 583 & 585.)

Of the said drawings, figure 1 denotes a plan. Fig. 2 denotes a side elevation. Fig. 3 denotes an elevation of one of the parts of my netting-machine, which may be called the "feeder." Fig. 4 is an elevation of the other principal part of my machine, which I call the "twister." Figs. 3 and 4 show the two principal parts of the said machine as disconnected from each other, or an inside view or elevation of each part when they are connected to each other.

The principal and main features of novelty of my invention consist in the principle of the revolving of the wires parallel to each other at the same time they are being twisted, and the other parts and movements of my machine to produce the effects hereinafter described.

To carry out my invention and design fully, and first to manufacture my wire-netting and wire-fence machines, it is the best plan, in my opinion, to construct the various parts of said machines of such materials as are hereinafter named. The frames should be of cast-iron, also the cams, the stands, and gearing of the same material. The levers and shippers throughout should be of wrought-iron. The jaws G G may be made of cast-iron, to which must be attached pieces of steel where the same come in contact with the wires. The netting beam or cylinder H may be made of hardwood, with iron centers, and the ratchet-gear on said cylinder may be of cast-iron. The center part of the wire-reels may be made of wood, with a sheet-iron rim on flange on each side.

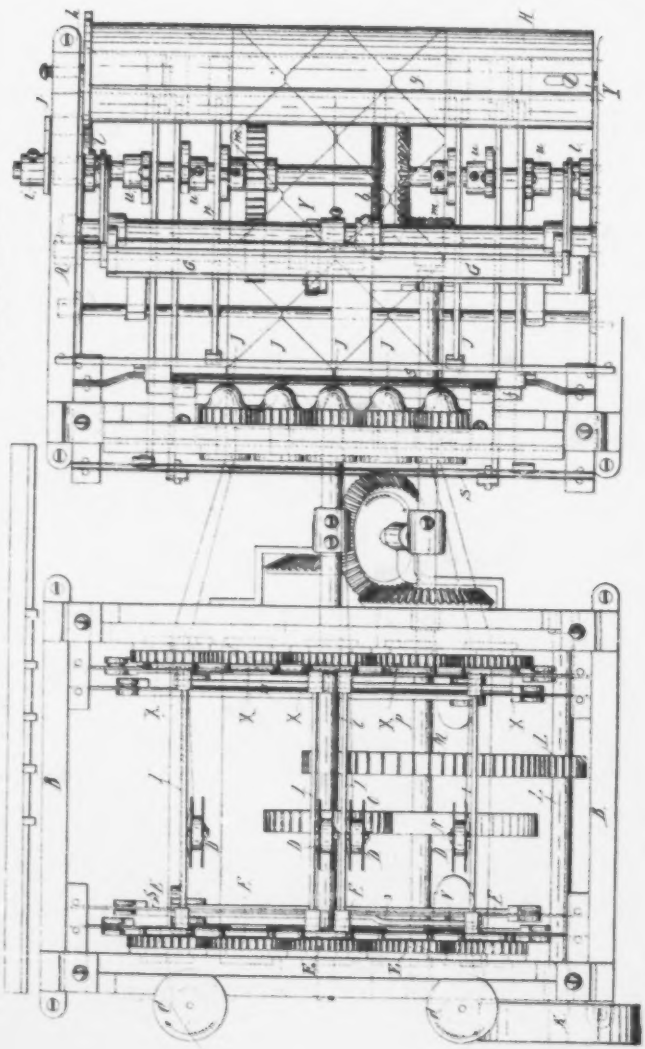
It will be readily understood by any good practical workman, by inspecting the enclosed drawings and specification, and following out the details described hereinafter, how to make, construct, and use my wire-netting machines. It is necessary to have machines for making every different size of the netting or fence—that is, for every different size of the meshes of the same—and any width of

4 Sheets—Sheet 1.

J. NESMITH.

WIRE NETTING MACHINE.

No. 10,743. Patented Apr. 4, 1854.



4 Sheets—Sheet 2.

J. NESMITH.

WIRE NETTING MACHINE.

No. 10,743. Patented Apr. 4, 1854.

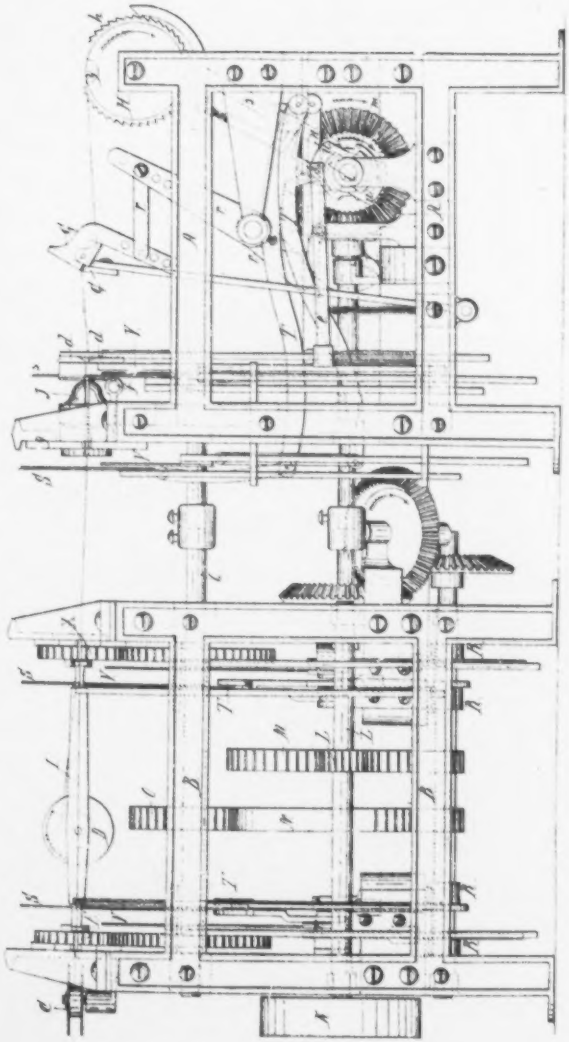


Fig 1.

4 Sheets--Sheet 3.

J. NESMITH.

WIRE NETTING MACHINE.

No. 10,743 Patented Apr. 4, 1854.

Fig 3

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4 Sheets—Sheet 4.

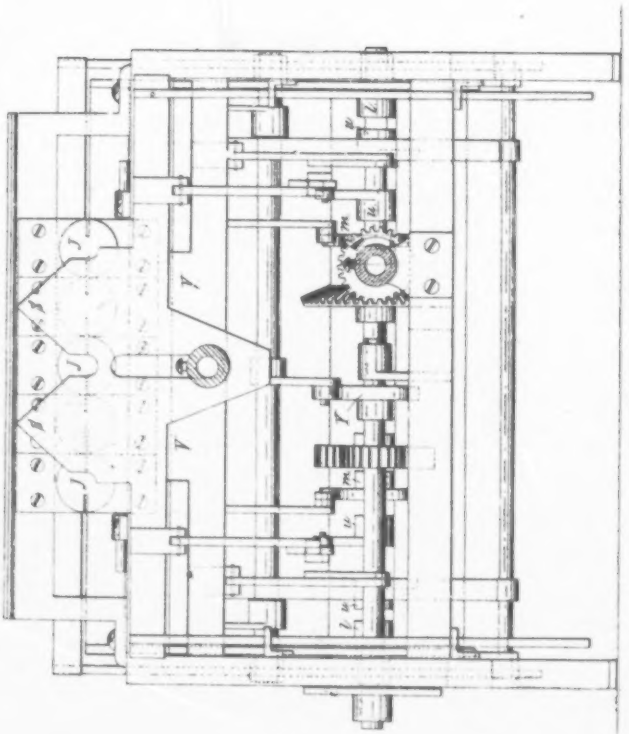
J. NESMITH.

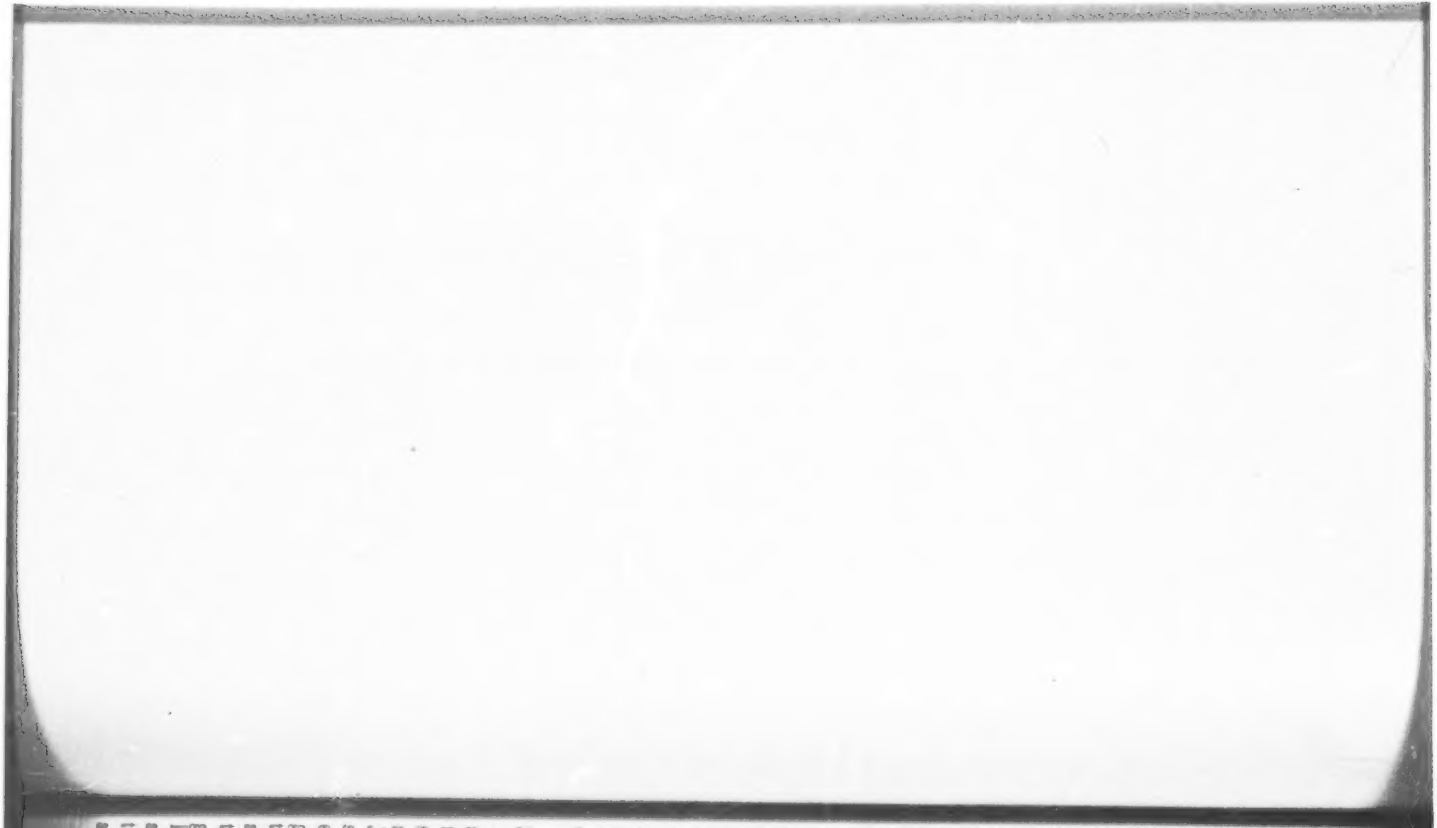
WIRE NETTING MACHINE.

No. 10,743. Patented Apr. 4, 1854.

Katonah & Co. No 1458 p. 5 Fig 5 Kittleman

Fig 4





the netting less than the whole scope of the machine can be made by simply drawing in the number of wires desired, as will be understood hereinafter; and in proceeding to operate or use my netting-machines it will be seen by examining the drawings that the same are composed of two parts connected together by two shafts, as seen at P and Q, Fig. 1, and one of the said parts I call the "twister," the frame of which is shown at A A, Fig. 2. The other part I call the "feeder," the frame of which can be seen at B B, Fig. 2.

The border-wire to netting and top and bottom wire in fence is usually larger than the wire to be twisted, although the wires can all be of the same size, if desired. The wire is placed upon the reels C C, Fig. 1, and then one end of the same is passed through a hole which is drilled in the center of the four outside gears, E E and X X, Fig. 1. The said wires are then passed to the twisting part of the machine, and through holes drilled in the centers of the two outside twisting-gears, J J, Fig. 1. Then the said wire is passed between the jaws G G, Fig. 2, and then to the cylinder H, as seen at Figs. 1 and 2, and firmly secured to the same by a clamp *g*, and a catch *y*, which can be seen at Figs. 1 and 2, then the wires to be twisted, which are wound upon or around the reels D D D D, Fig. 1. Said reels are then placed upon the stand I I I I, Figs. 1 and 2, on which they revolve as the wire is being drawn off from them. One end of the wire on each of the four reels D D D D is then passed through one end of the reel stand I I I I, Fig. 1, thence to and through the slots in the twisting-gears J J J J, Fig. 1, and then they are passed between the jaws G G Fig. 2, and thence to the cylinder H, Figs. 1 and 2, and secured to the said cylinder by the same contrivance as the border-wires before described. The said wires being all adjusted, as above mentioned, the power is applied to the driving-pulley K, Fig. 1, which is conveyed to the shafts P and Q, Fig. 1, by means of the shaft L and gears L and M, as seen at Fig. 1. The shippers S S S S, Figs. 1 and 2, being first raised by the cams R R and U U Fig. 2, operating against or raising the levers T T,
587 which are shown in Fig. 2, it being understood that the shippers S S in the twisting part of my machine act in concert with and simultaneously with the shippers S S in the feeding part of my machine. By this movement they are brought into the position as shown in Fig. 2 of the drawings, and then stop moving, and as soon as the movement of the said shippers ceases the twisting gears J J J J J Fig. 1 and the feeding-gears E E E E E E and X X X X X, as seen at Fig. 1, make two revolutions, they revolving exactly with each other, so as to keep the wires parallel and from getting entangled with each other, two revolutions of the said gears being all the twisting that is necessary at each end of the meshes in the netting and fence for making good substantial work, although more or less twisting of the wire may be obtained, if desired, by altering the gearing in the following manner—viz., by enlarging the gear N, Fig. 1, if more than two revolutions are required of the said twisting and feeding gears, and by reducing the gear N, Fig. 1, if less than two revolutions are wanted in the said feeding and twisting gears at each end of the meshes in the netting.

The before-mentioned gears J J J J J and E E E E E and X X X

X X after making two revolutions, as before stated, cease moving, which is effected by a part of the teeth of the gear N, Fig. 1, being cut off from its periphery, and as the said twisting and feeding gears stop revolving in such position that the slots in the said gears are on a line with each other, so that the wires can be shipped from one set of gears to the others by the shippers S S S S, Figs. 1, 2, 3 and 4, and so that the wires can be shipped back from one set of gears to the others by the shippers V V V V, Figs. 1, 2, 3 and 4, it being understood that the said feeding and twisting gears revolve and stop alternately—that is, they revolve when the shippers cease moving, and that the shippers perform their duty while the said gears remain motionless, and as the said gears stop revolving the jaws G G in the twisting part of my machine are moved backward nearly to the twisting-gears J J J J J by the cam Y and arms and connecting-pieces *r*, Fig. 2, and the spring *b*, Fig. 1, and by the peculiar construction of the upper jaw, G, and connecting-pieces *r*, they (the said jaws G G, Fig. 2) are brought together upon the wire and then moved forward, or toward the cylinder H, one-half the length of the meshes of the netting, as will readily be understood by inspection of the drawings, and when the wire is so drawn forward and the jaws G G stop, then the shippers S S S S, Figs. 1, 2, 3 and 4—that is, one of the two sets of shippers on each side of the feeder-frame and one of the two sets of shippers Figs. 1 and 4 on each side of the twisting-gears—are first raised by the cams R and U, said shippers then remaining in this position until the wire is sufficiently twisted. Then they are depressed or moved downward to their lowest position, as seen at V V V V, Fig. 2. Then the said sets of shippers V V V V, Fig. 2, on each side of the frame B and each side of the twisting-gears J J J J are moved upward by the cams R and U by the same operation as the shippers S S S S, before described, and by the upward movement of the said shippers V V V V the wires are shipped from the position in which they were left by the shippers S S S S to the other feeding and twisting gears, as will be readily understood by inspection of the drawings—that is, one set of shippers move the four inside wires one way and the other set of shippers will move the four inside wires the other way at the required time to harmonize with the other correct movements of the machine. The two outside or border wires never move transversely, but move longitudinally, like the other wires, except that they pass through holes drilled in the center of the four outside feeding-gears and the two outside twisting gears. The two outside small wires are wound twice around the border-wires at every other twisting operation, as will be seen by inspection of Fig. 1.

The reel-stands I I I I, Fig. 1, have each a spring on the side next the reel, the object being to produce friction and to prevent the wire from coming off the reels too easily.

The wire for netting, fencing, &c., should be well annealed. The necessity of this will be readily understood by practical workmen. The take-up motion to the cylinder H, Figs. 1 and 2, is composed of a ratchet-gear, *h*, Fig. 1, and cam *i*, Fig. 1, and lever *j*, Fig. 1.

At *f*, Fig. 2, is shown a shaft which supports a straight-edge, over which the wires travel as they pass through the machine.

d d, Fig. 2, are two movable planes that are moved or brought together by means of the cams *l* and *m*, Fig. 1, and levers *e* and *n*, Fig. 1, the object of the said planes being to guide the wires when they are shipped, and to hold the wires firmly while they are being twisted, so that the wires may not be sprung where they are not twisted, and at the end of each twisting operation they (the said planes *d d*) open or move apart, but are together, as seen at *d d*, Fig. 1. On the top plane, *d*, there are five small vertical projections—one in the front of the center of each gear. These projections are to prevent the wire from being twisted too far into the meshes.

By inspecting the drawings it will be seen that the jaws G G are made in such shape that as they are moved backward by the cam Y and arms *r*, the jaws are opened, and when they are moving forward they are brought in contact with the wire by shutting together, by which operation the said wire is moved from one twisting operation to another, and so on.

It being understood that the take-up motion acts or operates at the right time, so as to keep the wire straight and smooth during the operation of the said machine, as hereinbefore set forth, and having thus described my invention, I will state my claims as follows:

588–590

1. Revolving the wires by the means, substantially as described, for the purposes of keeping them parallel to each other, so that they cannot get entangled with each other during the process of making the netting or fencing.

2. Vibrating the wires alternately from the left to the right, or the right to the left, before or after or at the same time of twisting them (the said wires) together, by means of the cams R and U, the shippers S S and V V, connected to the said cams by levers T T, as seen in the drawings, or substantially the same, for the purposes of making wire netting and fencing.

3. The jaws or clamps G G, or the same in substance, for the purpose of drawing the wire through the machine at the required times by means of the cams and levers operating the same, essentially as laid down in the within specification and drawings.

4. The two planes *d d*, or their mechanical equivalents, with the cams and levers for operating the same, substantially as and for the purposes set forth.

5. The wire-reels and movable reel-stands, with the friction-springs for the reels, and holes through either end of the said reel-stands for admitting, protecting, and guiding the wire, or the mechanical equivalents of the said reels and reel-stands.

6. The feeding and twisting gears, with or without their centers perforated to admit the border or warp wires passing through the same, and the said gears having slots cut in them, for the receiving and sliding of the ends of the stands and wires in the same, substantially as hereinbefore set forth and specified.

JOHN NESMITH.

Witnesses:

SAMUEL C. PRATT.
JOSHUA MERRILL.

592 United States Patent Office.

LIVERAS HULL, of Charleston, Massachusetts.

For Improvement in Braiding Machines.

Specification forming part of Letters Patent No. 13,391. Dated August 7, 1855. Application filed January 23, 1855.

Specification.

To all persons to whom these presents shall come:

Be it known that I, Liveras Hull, of Charlestown, in the county of Middlesex and State of Massachusetts, have invented an improved braiding machine; and I do hereby declare that the same is fully described and represented in the following specification and the accompanying drawings, letters, figures and references thereof.

(Here follows diagram marked p. 591.)

Of said drawings figure 1 denotes a top view of the said machine; figure 2 is a side elevation of it; figure 3 is a vertical and longitudinal section of it.

The object of my machine is to braid the external covering of a whip stock or handle, said machine being equally adapted to braiding cord, or for covering threads of caoutchouc.

In its general features it is very similar to other braiding machines in use, although it differs from them in some essential particulars, as will be hereinafter described.

In the drawings A exhibits the main frame or base of the machine; B, B, B the several forms or circular discs, which in this machine are arranged horizontally and applied to their respective carriers or gears, C, C, C, and so as to rotate with them; such carriers also being arranged horizontally within their frame and made to mesh into one another, so that when any one of them is put in revolution, all the rest of them will be simultaneously set in rotation.

D, D, D are the several racers, one of which is exhibited in said view in figure 4. They run or travel in serpentine paths (as seen at E, E,), which cross one another and are formed between the several "*forms*" and concentric openings made through the upper plate of the main frame. In this respect the machine does not differ from others whose "forms" are stationary and disposed in one horizontal plane. Each racer has its bobbin F arranged in it so that its axis shall stand *horizontally* or nearly so, and in the upper part of the frame of the racer. The bobbin has a ratchet G, with which a bent lever pawl H operates, such pawl being pressed towards the ratchet by the elastic action of the spring I disposed as seen in the drawings. Underneath each bobbin and applied to the racer frame so that it may play freely upward or downward is a weight K, which has a hook by which it is suspended to the thread, *b*, that proceeds

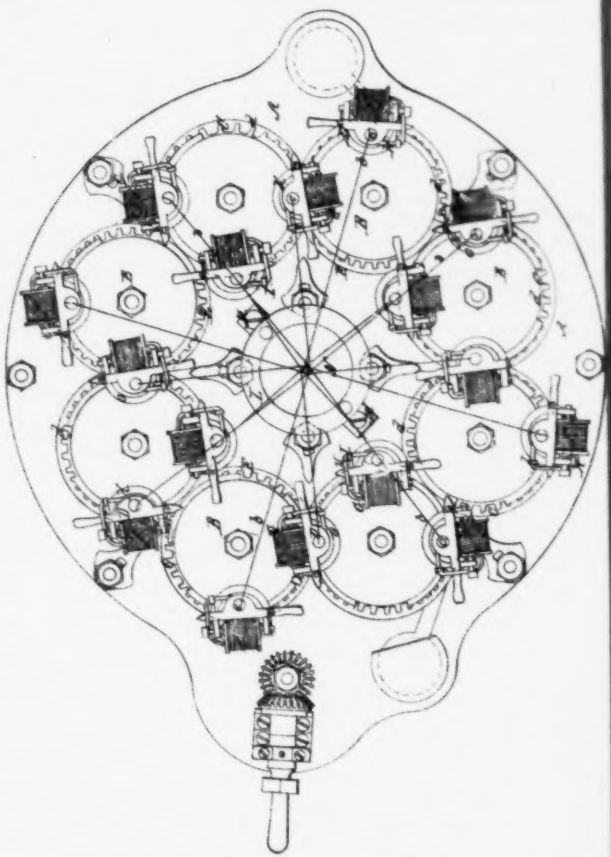
Sheet 1, 2 Sheets.

L. Hull.

Braiding Mach.

No. 13,391. Patented Aug. 7, 1855.

Fig. 1.



Akron Ohio Pub. Lib. 391 Reference

downward from the bobbin. Such thread after leaving the hook is pressed up through an eye, *c* (made in the upper part of the frame of the racer), and thence towards the central part of a supporting annulus or ring, L, which is elevated on posts, M, M, and directly over a passage, N, made downwards through the frame A, as seen in figure 3. Each racer is provided with an extra or upper head, O, which during its movements rests upon the upper surfaces of the forms and the top plate of the frame and serves to give steadiness and support to the racer.

The lower head of the racer is seen at P, the same being received within recesses, *d*, *d*, made in the usual way between the forms and their carriers.

The object of the weight which is carried by each racer, is to maintain an equality of tension upon the thread during the eccentric movements of the racer. It is not new to apply a weight to a racer for such purposes, but when it has been so applied it has been disposed *within* the bobbin or made to play in a *tube* or *case*, which not only gave support to the bobbin, but was encompassed by it—the axis of the bobbin being made to stand vertically. Under this latter arrangement of the bobbin it became necessary to carry the thread through two or more eyes or guide holes, before it could be passed through the eye at the head or upper end " " " of the racer. So many guides to the thread not only produces great friction and wear upon it, but the peculiar arrangement of the bobbin renders it liable *to be lifted off* its seat by the action of the thread while the latter is being unwound from near the lower head of the bobbin, an operation which is injurious to the action of the machine. By my improved arrangement of the bobbin and weight no thread guides between the former and latter are necessary.

Besides this, there is no lifting action upon the bobbin, while it and the weight are freely exposed in order to enable an attendant to piece or mend the thread with facility whenever it may be broken.

During the elevation of the weight, K, it will be carried against the tail or lower arm of the lever pawl H, and be caused
593 & 594 to move said pawl so as to release it from the ratchet and thereby permit the bobbin to revolve and give out thread, the revolution of the bobbin being effected by the gravitating power of the weight. As soon as the weight falls away from the pawl the latter will be forced against its ratchet by the contractile power of the spring I.

What I claim as my invention is the arrangement of the bobbin, the pawl and the weight within the racer, or with respect to one another therein, substantially as specified, the same presenting advantages as stated.

In testimony whereof I have hereunto set my signature this twenty-fifth day of May, A. D. 1855.

LIVERAS HULL.

Witnesses:

R. H. EDDY,

F. P. HALE, JR.

596 United States Patent Office.

JOHN MCCAHEY and STEPHEN B. SALISBURY, of Providence, Rhode Island, assignors to the New England Butt Company, of same place.

Letters Patent No. 112,946, dated March 21, 1871.

Improvement in Braiding-machines.

The schedule referred to in these letters patent and making part of the same.

To whom it may concern:

Be it known that we, John McCahey and Stephen B. Salisbury, both of Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful improvements in machines for making braid; and do hereby declare the following to be a full and correct description thereof, reference being had to accompanying drawing making part of this specification, and to the letters and numbers of reference marked thereon, similar letters and numbers being used in all the figures to denote the same parts.

The fabric produced by the braiding-machine with these improvements is substantially a union of two or more braids, of the same or different colors or materials, joined together by interlocking their edges while in the process of making, and is accomplished mainly by making the "run" or groove that guides the spool carriers of a peculiar form, and by the construction and position of the driving-wheels and the "horns" on them, whereby the force that drives the carriers is applied in the proper direction.

(Here follows diagram marked p. 595.)

J. McCAHEY & S. B. SALISBURY.

BRAIDING MACHINE.

No. 112,946. Patented Mar 21. 1871

Fig 1.

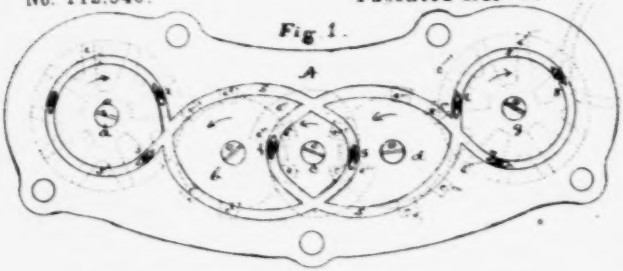


Fig 2.

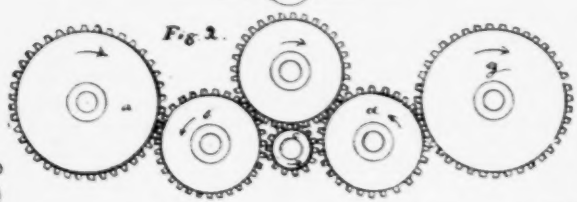
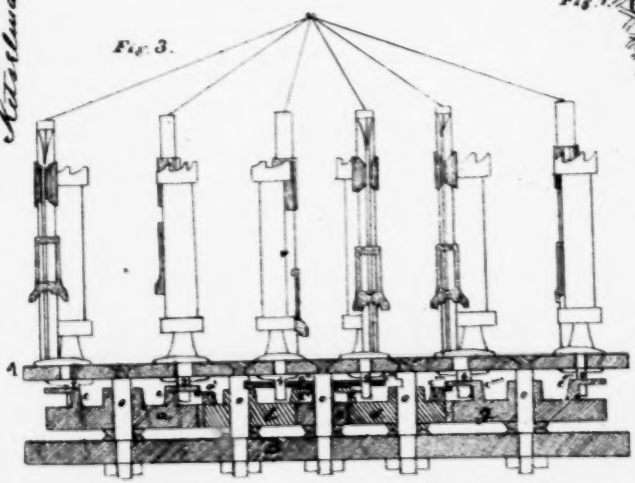


Fig 4.

Fig 3.



Witnessed.

Henry L Leonard.

Benjamin Arnold

Inventors.

John McCahey

Stephen B Salisbury

Description of the Drawing.

Figure 1 is a view of the top plate, showing the shape of the run; also, by dotted lines, the position of the drivers and the horns on them.

Figure 2 is a top view of the gearing.

Figure 3 shows a longitudinal section, taken vertically through the centers of the gear-wheels *a b c d g*.

Figure 4 shows the position of the strands of the braid as they are interlocked.

General Description.

A is the top plate, having the run S, as it is called, a groove of nearly uniform width, cut through it.

The parts of the plate inclosed by the run are called "quoits," and they are held in their places by being screwed to the tops of the studs *o o*, which are fastened to the lower plate B by passing through it, and having nuts screwed on their ends.

These studs also hold the driving-wheels *a b c d g*, which are free to turn on the studs, and are furnished with teeth to gear together and drive one another.

e e' e'' e''' e'''' are projections on the upper sides of the driving-wheels, called horns.

These horns are made of different heights; those on the wheels *a* and *g* are high enough to pass over the horns on the wheels *b* and *d* next to them, that they may not hit in passing each other and drive the carriers from one part of the run to another. These horns are made in pairs, so as to form recesses between them to receive the studs or lower ends of the spool-carriers. The carriers are indicated by the figures 1 2 3 4 5 6 7 8 in Fig. 1. The driving-wheels being put in motion in the direction indicated by the arrows, each carrier in the end circles of the run will be driven around that circle by its lower end, which projects down between the horns on the wheel under that circle. (See Fig. 3.)

When a carrier, after passing around the end circle, comes to the crossing in the run, the width of that part of the carrier in the run keeps it in such a position that it enters the next circle or oval of the run, the horns on the next driving-wheel taking it from the first one and driving it forward.

Now, the run between the two outside circles is composed of two circles or ovals, overlapping each other in the middle; this brings the crossings of the ovals in such a position that a carrier, having entered the oval, cannot leave it at the middle crossing to enter the next oval, but must continue in the same until it gets back to the outside circle it started from, so that two carriers starting, one from each of the outside circles, at the same time, will pass around each other in the middle, (see 4 and 5 in Fig. 1,) where the ovals overlap each other, and this interlocks their threads; and, as each carrier in the outer circle in its turn passes around another in the middle, it follows that the two braids are interlocked by each strand in its turn. (See Fig. 4.)

When the spool-carriers leave the outer circle of the run they enter the horns e' and e'''' on wheels b and d, which drive them forward until they come to the crossing of the run where the ovals overlap each other. Here they are taken by the horns e'' e'' on the center wheel c, which drive them around the ends of the ovals, the lower ends of the carriers passing inside of the horns e' and e''', between them and the centers of the wheels on which they are, (see Fig. 3,) until they come to the other crossing, where they are again taken between the horns e' and e''' on the wheels b and d, and carried to the outer circles from which they started. This keeps each set of strands by itself, excepting at the edges where they are interlocked, and it will be seen that any number of sets like the outer circles before mentioned may be joined in the same way by having the overlapping circles or ovals placed between them, as above described, and thus form a braid of strips of different colors or materials, either flat or circular, as may be desired. The dotted lines g' to the right hand of Fig. 1 show how this extending of the ovals can be made.

The braid is drawn up with feed-rolls placed above the spools, in the manner usual in this class of machines, and not necessary to be particularly described here, nor have we deemed it essential to describe more particularly the upper part of the spool-carriers, with their tensions, &c., as any of the usual modes may be used.

597 & 598 What we claim as our invention is—

1. A run or guiding-groove for the spool-carriers, formed of two circles or ovals overlapping each other so as to form a circular space between them, substantially as herein shown and described, and for the purpose specified.

2. The arrangement of the wheels b c d and the horns e' e'' e''' whereby the studs or lower ends of the spool-carriers are carried in between the horns e' e''' and the centers of the wheels b and d, on which those horns are placed, substantially as and for the purpose specified.

3. The combination of the run S and driving-wheels b c d, substantially as herein described, whereby the carrier-studs are made to pass between the horns e' and e''' and the centers of the wheels on which those horns are placed.

JOHN McCAHEY.
STEPHEN B. SALISBURY.

Witnesses:

HENRY L. LEONARD.
BENJAMIN ARNOLD.

J. F. GLIDDEN & P. W. VAUGHAN.

Machines for Making Wire-Fences.

No 157,508. Patented Dec. 8, 1874.

No. 1458 Adkinson & Co. v. Kirkham

Fig. 1

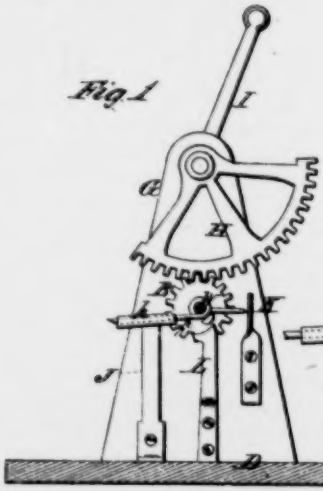


Fig. 3

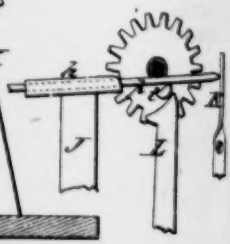
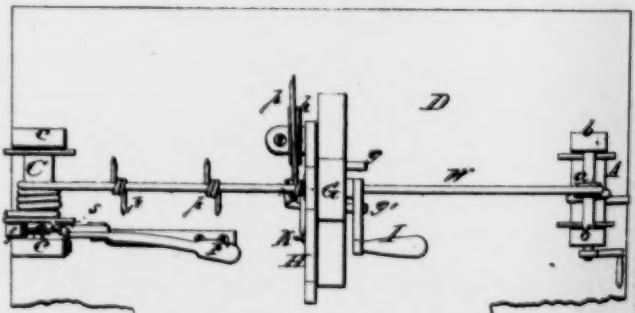


Fig. 2



WITNESSES

Robert Ewell

M. Carroll

INVENTORS

J. F. Glidden.

P. W. Vaughan.

Chapman & Dewey

ATTORNEYS

600-602

United States Patent Office.

JOSEPH F. GLIDDEN and PHINEAS W. VAUGHAN, of De Kalb, Illinois.

Improvement in Machines for Making Wire Fences.

Specification forming part of Letters Patent No. 157,508, dated December 8, 1874; application filed October 24, 1874.

To all whom it may concern:

Be it known that we, Joseph F. Glidden and Phineas W. Vaughan, of De Kalb, in the county of De Kalb and State of Illinois, have invented a new and valuable improvement in a machine for making wire fence; and we do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, and to the letters and figures of reference marked thereon.

(Here follows diagram marked p. 599.)

Figure 1 of the drawings is a representation of a side view of our machine. Fig. 2 is a plan view of the same, and Fig. 3 is a detail view.

Our invention is designed for facilitating the work of applying wire barbs to fence-wire; and it consists in the employment of reels, on which the fence-wire is wound, a pinion through which the fence-wire is drawn, and a segment for rotating the pinion, in combination with a twisting-lug on the face of the pinion, a guide-table, a keeper, and a gage, all constructed and so arranged that when a barb-wire is adjusted in its place, and a stroke given to the toothed segment, the barb-wire will be wound several turns on the fence-wire, as will be hereinafter fully explained.

In the annexed drawings, A designates a reel, on which the wire is wound, and from which it is taken, carried over a grooved pulley, *a*, passed through shaft of a pinion, B, and wound upon a reel, C. The reel A and the shaft of pulley *a* have their bearings in standards *b b*, rising from a foundation, D, and the reel C has its bearings in standards *c c*, rising from the same foundation. On the shaft of the reel C a ratchet-wheel, *e*, is keyed, which is rotated intermittently by means of a claw-pawl, *f*, on a long treadle, F, and which is prevented from being turned backward by a spring, *s*. The tubular shaft of the pinion B has its bearing in a standard, G, rising from the foundation D between the two reels A C, and, with the teeth of this

pinion B, engage the teeth on a vibrating segment, H, on the shaft of which a crank-arm, I, is keyed. Two stops, *g g'*, limit the length of strokes given to the segment H. J designates a standard, which carries a trough-shaped support, *h*. K designates a gage, against which one end of a barb-wire is held when first introduced into the machine to be wound upon the fence-wire, and L designates a spring-keeper, the upper curved end of which presses against the face of the wheel B, between the support *h* and the gage K. A wire, *p*, which is of the proper length, and which is pointed at both ends, is adjusted on the support *h* and against the gage K and face of the wheel B. When the barb-wire *p* is thus adjusted, it will lie over the flat side of a twisting-lug, *t*, on the face of the wheel B, as shown in Fig. 3. The segment H is then given one stroke, and the wheel B rotated, thus winding the barb-wire *p* several turns around the fence-wire W, as shown in Fig. 2. The fence-wire is then wound upon the reel C, and another barb-wire applied, and so on the work is continued, leaving the barbs at regular intervals apart.

The spring-keeper prevents the barb-wires from slipping off the twister *t* during the operation of applying them on the fence-wires.

What we claim as new, and desire to secure by letters patent, is—

In combination with the reels A C, segment H, and a pinion, B, the latter having a lug, *t*, on its face, the support *h*, keeper L, and gage K, substantially in the manner and for the purpose described.

In testimony that we claim the above we have hereunto subscribed our names in the presence of two witnesses.

JOSEPH F. GLIDDEN.
PHINEAS W. VAUGHAN.

Witnesses:

J. B. GLIDDEN.
FRANK M. BLACKMAN.

C. K. SAWYER.

Wire-Holder for Making Fence-Cable.

No. 209,520. Patented Oct. 29, 1878.

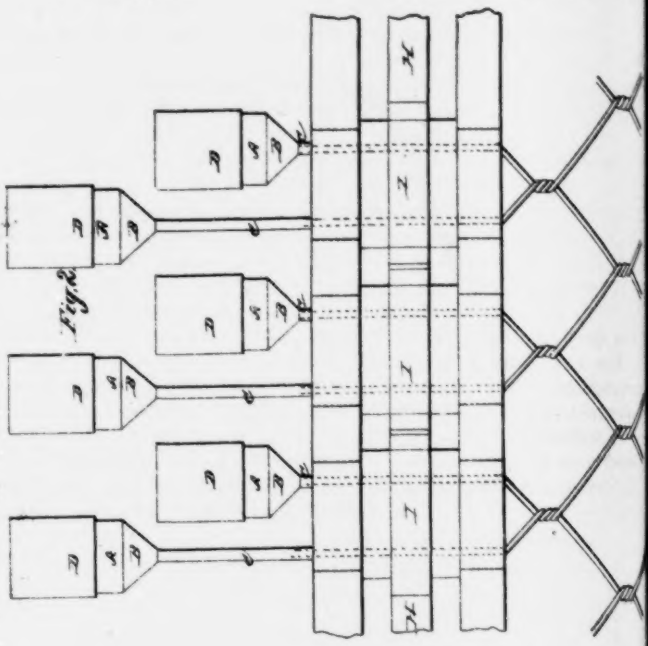


Fig. 2.

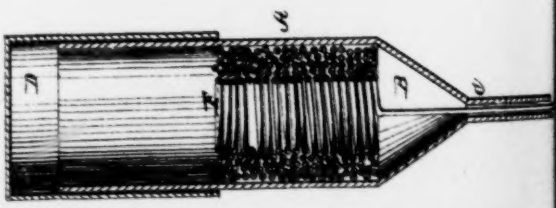


Fig. 1.

Witnesses:
H. C. Hopkins
C. L. Smith

Inventor
Caleb K. Sawyer

per
F. H. Alexander & Elliott
Attorneys

No. 148
Kokomo Co.
Kitselman

604-606

United States Patent Office.

CALEB K. SAWYER, of Clinton, Massachusetts.

Improvement in Wire-holders for Making Fence-cables.

Specification forming part of Letters Patent No. 209,520, dated October 29, 1878; application filed April 9, 1878.

To all whom it may concern:

Be it known that I, Caleb K. Sawyer, of Clinton, in the county of Worcester and State of Massachusetts, have invented certain new and useful improvements in apparatus for making wire fence; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

The nature of my invention consists in the construction and arrangement of a device for making wire fences, as will be hereinafter more fully set forth.

In order to enable others skilled in the art to which my invention appertains to make and use the same, I will now proceed to describe its construction and operation, referring to the annexed drawing, in which—

(Here follows diagram marked p. 603.)

Figure 1 is a central vertical section of the cup for holding the wire, and Fig. 2 a side elevation of a portion of the machine, showing the manner of using the cups.

A represents a sheet-metal cylinder of any suitable dimensions, open at one end and terminating in a funnel, B, at the other end, from the apex of which funnel extends a tube, C, as shown. The open end of the cylinder A is provided with a cap, D, as shown, closing over the same.

The wire is placed in the form of a cop or ball, F, in the cylinder A and the wire drawn from the inside of such cop or ball through the end of the funnel B and the tube C.

A series of these devices are used in making a wire fence, in the manner shown in Fig. 2, a series of gears, I, being operated by a rack-bar, H, and two wires passing through each gear. These gears are made in two parts, divided in the center, and they are made to revolve twice around, twisting the wires, and then passing from one to the other, thereby forming the diamond-shaped mesh and making any width of fence desired.

The wire is drawn from the inside of the ball F and comes from the same in coils, and is effectually straightened in passing through the funnel or concaved end of the cylinder and through the pipe or tube before it goes through the gear, thus preparing the wire to make uniform and even meshes in the fence.

Having thus fully described my invention, what I claim as new, and desire to secure by letters patent, is—

In a machine for making wire fencing, the combination of the hollow cup or cylinder A, provided with the concaved end B and projecting tube C, and the cover D, all constructed and arranged as described, whereby the wire is drawn from the inside of the ball or cop and straightened by being drawn through the concaved end and tube, substantially as and for the purposes herein set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

CALEB K. SAWYER.

Witnesses:

WM. B. ORCUTT.
F. T. ORCUTT.

1710

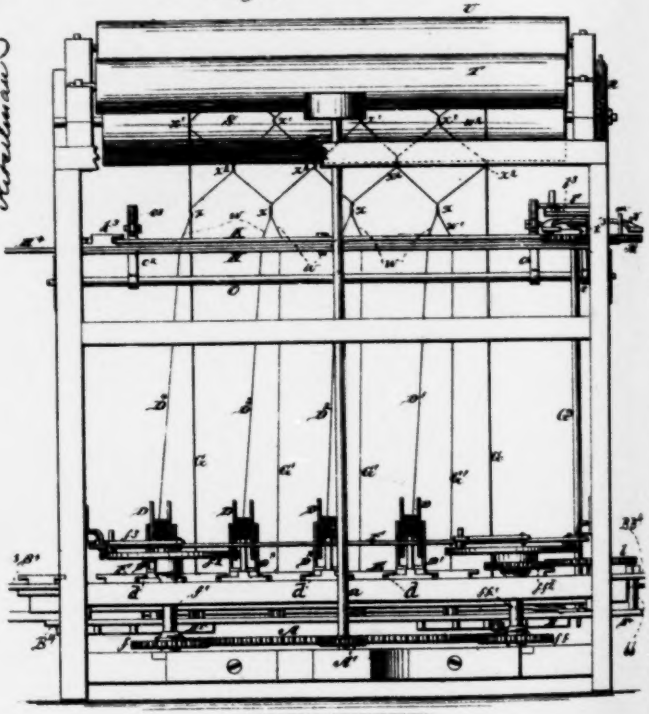
6 Sheets—Sheet 1.

I. SEDGWICK.

Wire-Twister.

No. 218,323. Patented Aug. 5, 1879.

Fig. 1.



WITNESSES

Robert Lovell,

W. H. Seymour.

INVENTOR

Isham Sedgwick

By Gilmore & Smith Hs

ATTORNEYS

1105

6 Sheets—Sheet 1.

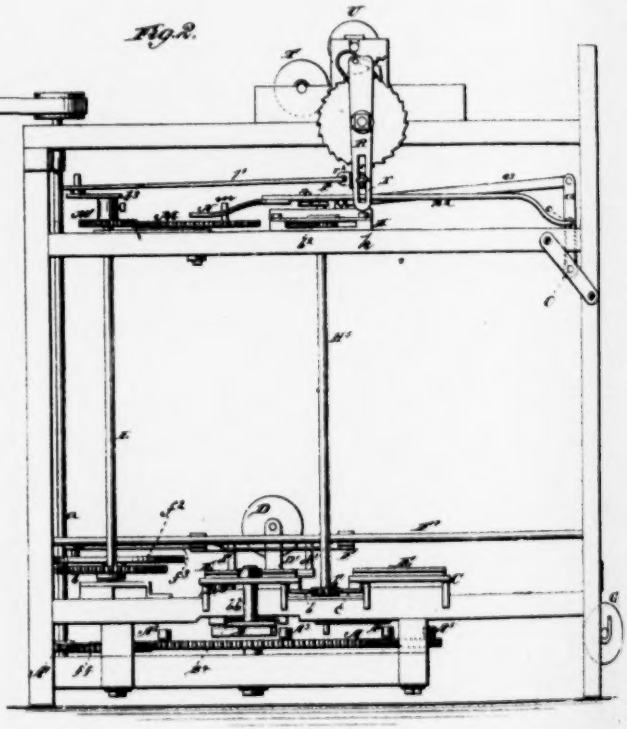
I. SEDGWICK.

Wire-Twister.

No. 218,323. Patented Aug. 5, 1879.

No 146 Reproduction Co. N. 609 Kitchener

Fig. 2.



WITNESSES

Robert Arnott

W. N. Stevenson

By

INVENTOR

Isham Sedgwick

Gilmore, Smith & Co

ATTORNEYS

17100

6 Sheets—Sheet 3

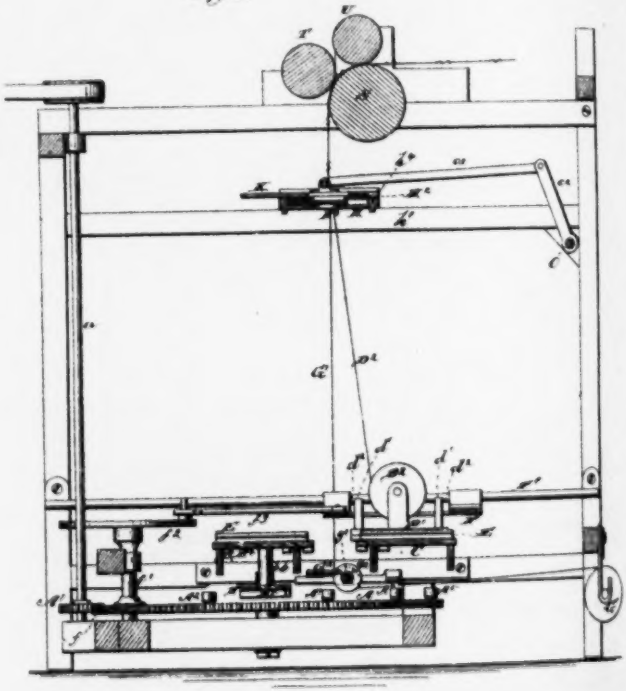
I. SEDGWICK.

Wire-Twister.

No. 218,323. Patented Aug. 5, 1879.

No 148 Koons & Atkinson } No 611

Fig 3.



WITNESSES
Robt Everett
W. M. Foxwell

INVENTOR:
Isham Sedgwick
Gilmore Smith & Co
ATTORNEYS

6 Sheets—Sheet 4.

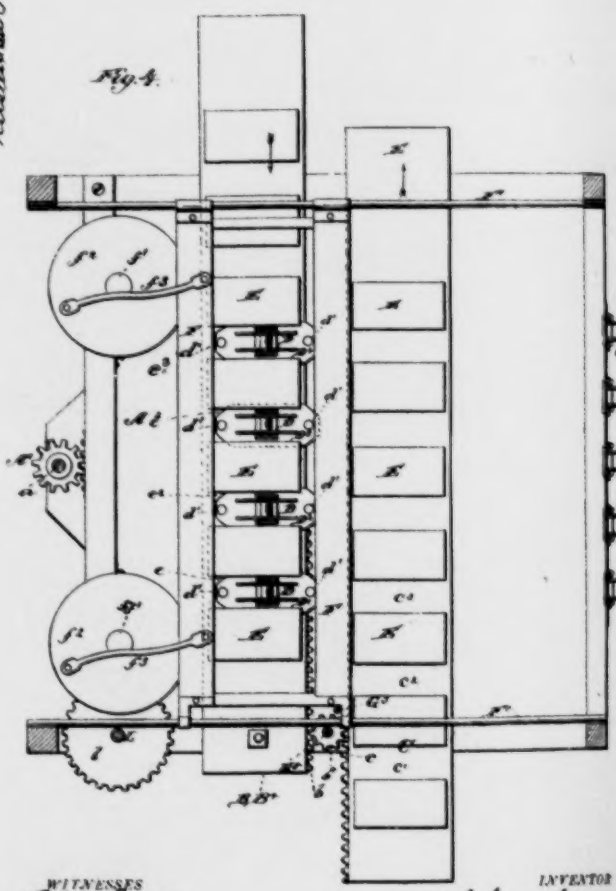
I. SEDGWICK.

Wire-Twister.

No. 218,323. Patented Aug. 5, 1879.

No. 1018 Interference to Cox & Kittredge

Fig. 4.



WITNESSES

Robert Everett

W. H. Sawyer

by

INVENTOR

Isham Sedgwick

Gilmore Smith & Co

ATTORNEYS

6 Sheets—Sheet 1

I. SEDGWICK.

Wire-Twister.

No. 218,323. Patented Aug. 5, 1879.

Fig. 5

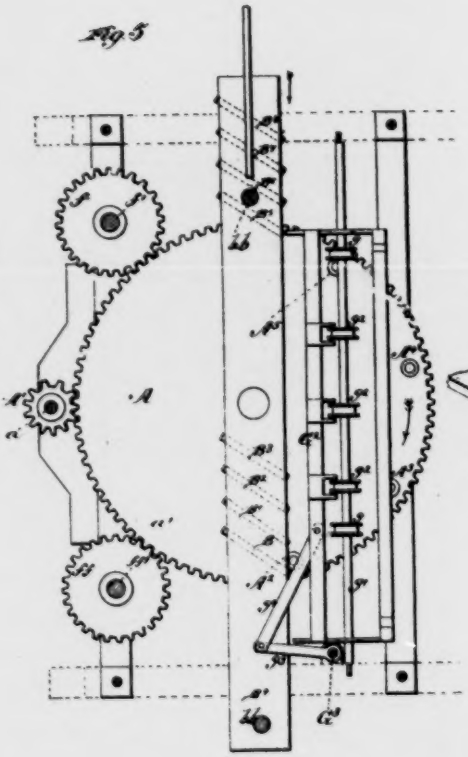
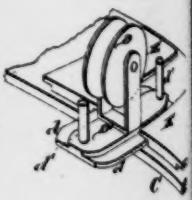


Fig. 6



WITNESSES

Robt. Everett

W. H. Sweeney

INVENTOR

Isham Sedgwick

by Gilmore Smith & Co.

ATTORNEYS

6 Sheets—Sheet 1.

I. SEDGWICK.

Wire-Twister.

No. 218,323. Patented Aug. 5, 1879.

Fig 7.

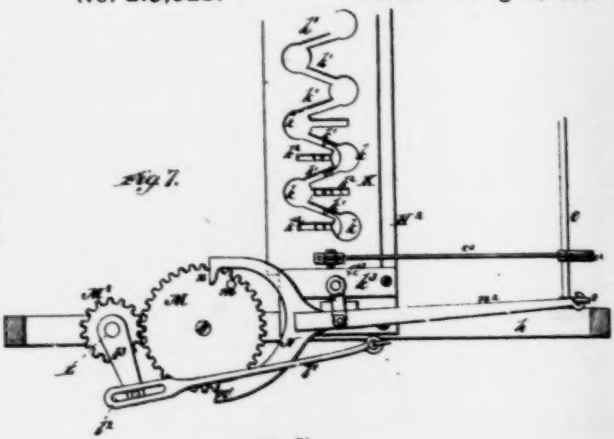


Fig 8.

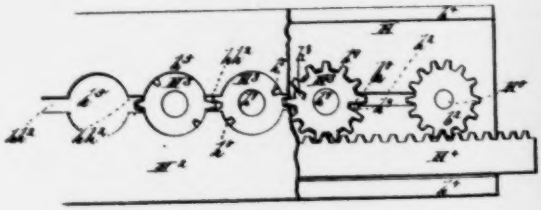


Fig 9.

WITNESSES

Robt Everett

W. N. Seward

By

INVENTOR

Isaham Sedgwick

Gilmore Smith & Co

ATTORNEYS

United States Patent Office.

ISHAM SEDGWICK, of Trenton, Indiana.

Improvement in Wire-twisters.

Specification forming part of Letters Patent No. 218,323, dated August 5, 1879; application filed April 5, 1879.

To all whom it may concern:

Be it known that I, Isham Sedgwick, of Trenton, in the county of Randolph and State of Indiana, have invented certain new and useful improvements in machines for making twisted-wire fabrics; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, in which—

(Here follow diagrams marked pp. 607, 609, 611, 613, 615, & 617.)

Figure 1 is a front elevation of a machine embodying the improvements in my invention. Fig. 2 is a side elevation of the same. Fig. 3 is a vertical central section, Fig. 4 is a horizontal section, Fig. 5 is a sectional detail view, Fig. 6 is a perspective detail view, Fig. 7 is a sectional detail view, Fig. 8 is a detail view, and Fig. 9 is a sectional detail view, of the invention.

Identical parts in the drawings are designated and referred to by the same letters.

My invention relates to machines for making twisted-wire fabrics; and it consists in the improvements in the construction of the machine, hereinafter fully described, and particularly pointed out in the claims.

Referring to the drawings, A designates the wheel for operating the mechanism, which is preferably driven by the pinion A^1 upon the shaft a, which latter should be provided with a fly-wheel to impart a regular motion to the mechanism. A^2, A^3, A^4, and A^5 are lugs, preferably composed of anti-friction sleeves on studs set in the face of the driving-wheel A, and located, as shown in the drawings, to engage with the cams B, B^1, B^2, and B^3 upon the left of the center of the plate B^4, and the cams B^5, B^6, B^7, and B^8 upon the right of the center of the plate B^4, in such a manner as to transmit from the rotary motion of the driving-wheel A to the plate B^4 a compound intermitting reciprocating motion, described more fully as follows, viz.: When the plate B^4 is in its extreme left-hand position, as shown in Fig. 5, the lug A^1 engages the cam B, and the driving-wheel A, continuing to revolve in the direction indicated by the arrow, causes the plate B^4 to be moved to the right a distance made

positive and uniform by the fixed inclination of the cams. The plate B^4 then remains at rest in that position until moved in a similar manner by the lug A^3 engaging the cam B^1. The plate B^4 again at rest until moved in the same direction by the action of the lug A^4 and cam B^2, when it is again at rest until it is a fourth time moved to the right, thus providing a compound intermittent motion of this plate B^4 to the right. In like manner, the same lugs A^2, A^3, A^4, and A^5 consecutively engage the cams B^5, B^6, B^7, and B^8, and cause an intermittent motion, or, rather, a series of intermittent motions, which returns the plate B^4 to its original position at the left as described, thus producing a reciprocating motion by means of a series of intermittent motions in each direction. The plate B^5 is rigidly connected to the plate B B^4 by means of the stud b b.

C (see Fig. 2) is a companion plate of B B^4, and is placed in operative connection with it by means of the rack b on B B^4, the pinion b^1, and the rack c on plate C.

D are spools for storing and carrying wire intended to enter into the construction of the fabric. These spools are supported and carried in proper places by spool-carriers D^1 D^2 D^3 D^4, which are provided with the flanges d and the drivers d'.

E are flanged plates, which are attached to the plates B, B^4, and C, and so constructed and arranged that the spool-carrier D^1 will slide freely between them longitudinally, and be rigidly held in position vertically.

The plate B B^4 being in the left position, as before described, and the rack c of the plate C being engaged with the pinion b^1, so as to place the spool-carrier D^1, situated in channel e (see Fig. 4) of plate B B^4, opposite to the channel c^3 of plate C at a time in the motion of the machine when the driving-rack F, traveling upon the ways and operated by the pinions f f f, shaft f^1 f^1 f^1, crank f^2, and connecting-rod f^3, engages the driver d', and forces D^1 into the channel c^3 of plate C, plate B B^4 is moved, by one of the cams and lugs before described, to the right, and plate C, by the pinion and racks, is moved to the left, as described, which reverse intermittent motions are sufficient to place channel e^1 of plate B B^4 opposite channel c^3 of plate C, when the driving-rack F engages the drivers d', and forces the spool-carrier D^1 into channel e^1 of plate B B^4.

619

By a similar motion of the driving-wheel the carrier D^1 is placed in the third or c^2 channel of the plate B B^4. The motions of the carrier D^1 during these motions are, first, a longitudinal motion from channel e of plate B B^4 to channel c^3 of plate C; second, thence to the left, or a latitudinal motion to the left; third, thence longitudinally from c^3 to channel e^1; fourth, thence by the motion of the plate B B^4 longitudinally to the right, thus completing the transit of D^1 around a rectangular path to its place of starting; fifth, thence again longitudinally from e^1 to c^2; sixth, thence again latitudinally to the left; seventh, thence from c^2 to e^2; eighth, thence again latitudinal motion to the right, completing the second revolution to the left of D^1; ninth, thence from e^2 to c^1; tenth, thence latitudinally to the right; eleventh, thence from c^1 to e^1; twelfth, thence latitu

ally to the left; thirteenth, thence from e^1 into c^2; fourteenth, thence to the right; fifteenth, thence from c^2 to e; thence left to the original position, thus completing two revolutions of D^1 to the right.

The outer wire-carriers, D^2 D^3 D^4, pass through motions identical with those described of the carrier D^1, which, in the aggregate, consist of two revolutions or circuits to the left by four right-angled motions for each revolution or circuit, and two revolutions or circuits to the right by four right-angled motions to each revolution or circuit.

G G are stationary spools on a frame for storing the edge-wires. G^1 G^1 are spools for storing a part of the wire for forming the meshes of the fabric. There are (see Figs. 3 and 5) stationary pulleys g on the shaft g^1, and g^2 are movable pulleys on the same shaft. These pulleys are for guiding the wires and shifting the position of the wires on the movable pulleys, to better enable the wires attached to and extending from the spools on the spool-carriers to be carried around the wires extending upward from the pulleys g and g^2. These movable pulleys g^2 are shifted by means of the rack G^2 and crank g^3 and connecting-rod g^4, operated by the shaft G^3. This rack shifts the movable pulleys to the right simultaneously with the first longitudinal motion of the carrier D^1, so as to lessen the longitudinal motion required to pass the carriers D^1, &c., around the wires G^1, and returns them to their original position on the ninth movement before described.

H is a plate extending from h to h^1, which are transverse beams of the frame. This plate is provided with a series of circular holes, h^2, which are adapted to receive the twisters H^3 H^3, shouldered, as shown in Fig. 9. These holes are connected by means of the slots h^2.

H^1 is the top plate or companion plate of H, and is provided with slots h h^2 and circular holes h^5. The plate H^1 is held at a distance above the plate H by means of the interposed strips or webs h^4. The holes h^5 and slots h^2 are located above those of the plate H. The webs h^4 form the slot or space h^6 between H and H^1.

H^3 are the disks which twist the wire into meshes, provided with the open centers or eyes h^7, the notches h^8 in their peripheries, the teeth h^9, and the hubs h^{10}.

H^4 is a rack playing in the space h^6, engaging all of the disks H^3, and revolving them, first, two revolutions to the left, and then two to the right, by the movement of the rack to the right and left, caused by the pinion b^3, shaft H^5, and pinion b^1, simultaneously with the right and left movement of the plate B B^4.

K is a sliding plate, provided with the holes k, inclined slots k^1, and right-angled slots k^2.

I^2 are ways, which are attached to the plate H^2 to serve as guides for the sliding plate K. Slots k^2 are for the edge-wires. These right-angled slots k^2 are immediately above the central openings or eyes of the twisting-disks, and they are located to allow the sliding plate K to move horizontally when the side or edge wires of the fence are passing through the eyes of the twisting-disks.

In case tension-wires running through the fence, but not deflected, are introduced, they would also pass through the eyes of the twisting-disks and play in these slots k^2.

L is a shaft transmitting motion from the driving-wheel A by means of the pinions $f f f f^2$, shaft $f f^1$, and pinion l, which connects the crank l^3 of the pinion M and ear r^2 of the lever R.

The connecting-rod l^4 is slotted, as shown at l^5, in such a manner that the crank l^3 operates it but one-half of a sweep.

M is a spur-wheel, carrying the wrist-pin m, driven by the pinion M^1.

N is a bifurcated rod, provided with hook n on one arm, and the face n^1 on the other arm, of the bifurcated end or arm of the rod. Its long arm n^2 engages the arm o of the rocking shaft O. There are longer arms, o^2, attached to the shaft O, which are connected with the sliding plate K by rods o^3.

P is a crank on shaft G^3, which serves as the fulcrum of the bifurcated arm or lever N.

R, Figs. 1 and 2, is the feed-lever, which has an intermittent motion given it by means of the slot l^5 in the connecting-rod l^4. This feed-lever has a slot, r, a pawl, r^1, and an adjustable ear, r^2, by means of which the feed motion given to the feed-rollers may be regulated at will.

S is the feed-roller, and T and U are co-operating feed-rollers, which may be forced upon the roller S in any suitable manner. These rollers T and U also serve the purpose of binding the fabric preparatory to rolling it up for packing.

An additional rack, similar to rack H^4, may be placed in connection with the toothed disks or twisters H^3, on one side of them, opposite to the rack H^4, and operated by the same pinion, b^2, that operates H^4.

620 The advantage of such an arrangement of parts is, that these two racks, operating in reverse directions upon opposite sides of the twisters H^3, provide an easier and more positive motion of the parts of the machine.

The operation of the machine is as follows: The two wires G G are the outside or edge wires of the fabric, as shown. These wires pass from their spools of the same letter to the stationary pulleys $g g$ on the shaft g^1, and from there extend upward through the eyes of the twisting-disks vertically above the pulleys $g g$, and from there they pass between the draw-feed rollers S T U.

The three wires G^1 G^1 G^1 pass from their spools of the same letter over the movable pulleys g^2 on the shaft g^1, and from there vertically upward through the notches upon the right-hand side of alternate ones of the series of twisting-disks H^3, and upward to the feed-rollers.

The wires D^1 D^2 D^3 from the supply-spools, located upon the carriers of the same letters, are passed through the notches upon the opposite or left sides of the same twisting-disks, and then upward under the feed-rollers.

The wire D^4 is passed through the left-hand notch of the twisting-disk, that has the left-hand edge-wire through its center, and then upward between the feed-rollers. This position of the wires is again reached at each alternate twisting in the mesh formation.

The movements of the spool-carriers, hereinbefore described,

the wires D^1 D^2 D^3 twice around to the left, and around their respective G^1 wires, as shown in Fig. 1, and also passes the D^4 wire twice around the G or edge wire, forming the double twists x^1 x^1 x^1; and then as the carriers are moved to the right, as hereinbefore described, the D^1 wire is passed twice to the right around the right-hand G wire, and the D^2 D^3 D^4 wires are each at the same time and in like manner passed around their respective G^1 wires, forming the double twists x^2 x^2 x^2. Simultaneously with these several motions of the spool-carriers and their wires the twisting-disks have formed the two twistings x^1 and x^2—the first, x, twisted to the left, and the second, x', to the right—and the motions of the wires which I have described have prevented any twisting or mesh formation below the plate H.

The holding of the wires in the twisting-disks, and their transfer at the proper time from one disk to another, are accomplished in the following manner, reference being had to Figs. 7, 8, and 9: The wires are passed through the notches h^8 of the twisting-disks. These twisting-disks are constructed with an eye, h^7, through which the edge-wires of the fabric are passed. The twisting-notches h^8 in the peripheries of the disks, where the wires which form the fabric are placed, the teeth h^9, for revolving the disks by the rack H^4, the hub h^{10} of the disk H^3, formed to rest in the holes h^5, and the plate H^2, hold these disks in position, while the edges of the holes h^5 in plate H^2 retain the wires in the notches of the disks while the twisting is being done.

The machine is so constructed and set up that as the plates B, B^4, and C are at rest, the notches h^8 of the twisters are in line with the slots h^3 of the plate H, and for each movement of the plates B, B^4, and C the twisters will be turned one-half of a revolution. After two revolutions to the left of the twisters and spool-carriers at this time, and while the studs A^7 A^5 are passing from the right to the left of the plate B^4, the disks are at rest during this time, and the sliding plate K is actuated by the spur-wheel M and the intermediate mechanism.

The inclined slots k^1, as they pass over the twisting-disks, engage the wires that may be in the notches of the same, carry them over and place them in the notches of the adjacent or intermediate twisting-disk while yet the disks are at rest, and hold the wires in the disks by the edges of the holes k until the twisting-disks revolve, when they are retained by the twisting of the wires.

The twisting is accomplished by placing the wires which are to be twisted together in opposite notches of the same twisting-disk.

As before stated, the wires are first placed in the notches in the opposite sides of each alternate twisting-disk. The series of meshes x', Fig. 1, are formed by the same disks that the meshes x are formed by.

The twisting of the meshes x being accomplished, the disks being, as before stated, at rest, the inclined slots k^1 transfer the wires w to the alternate or intermediate twisting-disks directly beneath the twisted portion of the wires at x^2, and which twisted the same, and the wire w^1 is, by the same means, transferred to the twisting-disk which has the right-hand edge-wire, G, in its eye, and by this disk

is carried twice around the G wire, forming the edge and half-mesh w^3.

When the twisting has been accomplished, the wires are again returned by the inclined slots k^1 to the disk from which they were taken, the same inclined slot carrying the same wire from one twister to the same twister and the same notch from which it was taken. From this it appears that when the machine is in operation one-half of the twisting-disks are idle—running but not forming meshes—one-half of the time, while the others are working to form meshes.

The draw-feed is taken up at the same time that the wires are being transferred from one disk to the other by the transfer-plate, and the length of the meshes is regulated at will by the feed-lever devices, so as to form a long diamond-shaped or square mesh.

The movable pulleys g^3 on the shaft g^1 are moved to the left as the carriers are turning to the left, and to the right as they are turned to the right, so as to lessen the latitudinal motion of the carriers in passing around the wires.

621 & 622 Having thus fully described my invention, what I claim as new and useful, and desire to secure by letters patent, is—

1. In a machine for forming wire fabric, a driving spur-wheel, A, provided with two or more lugs, A^2 A^3, in combination with the plates B^4 and B B^4, provided with four or more cams, B B^1 B^5 B^6, as and for the purposes set forth.

2. In a machine for forming wire fabric, the plates B^4 and B B^4, provided with the cams B B^1 B^5 B^6 and the rack *b*, in combination with the pinion b^1, rack *c*, and the plate C, as and for the purposes set forth.

3. In a machine for forming wire fabric, the spools D, mounted on a carrier, D^1, provided with flanges *d* and drivers d^1, as and for the purposes set forth.

4. In a machine for forming wire fabric, the spools D, mounted on a carrier D^1, provided with flanges *d* and drivers d^1, in combination with the driving-rack F, as and for the purposes set forth.

5. In a machine for forming wire fabric, the combination, with the driving-rack F, of the spool-carriers provided with the spool D and the driving-studs d', the distance between said driving-studs being less than the distance between the bars of the driving-rack F, as and for the purposes set forth.

6. In a machine for forming wire fabric, the driving-rack F, in combination with the spool-carriers D^1 and the plates B B^4 and C, as and for the purposes set forth.

7. In a machine for forming wire fabric, the plate B B^4, provided with the rack *b*, in combination with the pinion b^1 and the plate C, provided with the rack *c*, as and for the purposes set forth.

8. In a machine for forming wire fabric, the plate B B^4, provided with the flanged plates E, in combination with the spool-carriers D^1 and the plate C, having flanges E, as and for the purposes set forth.

9. In a machine for forming wire fabric, the combination of the shaft g^1, carrying two or more fixed pulleys, and one or more mov-

able pulleys, g^2, and the sliding rack G^2, embracing the peripheries of the movable pulleys, as and for the purposes set forth.

10. In a machine for forming wire fabric, the shaft g^1, provided with fixed and movable pulleys, in combination with the spur-wheel M, the bifurcated rod N, crank P, shaft G^3, crank g^3, pitman g^4, and sliding rack G^2, as and for the purposes set forth.

11. In a machine for forming wire fabric, the spur-wheel M, with the stud m, in combination with the bifurcated lever N, mounted upon a crank, P, as and for the purpose set forth.

12. In a machine for forming wire fabric, the combination of the spur-wheel M, stud m, bifurcated lever N, arm o, rock-shaft O, arms o^2, connecting rods o^3, and the sliding plate K, as and for the purposes set forth.

13. In a machine for forming wire fabric, the twisting-pinions or revolving disks H^3, provided with notches h^8 and eyes h^7, as and for the purposes set forth.

14. In a machine for forming wire fabric, the twisting pinions H^3, provided with eyes h^7 and notches h^8, in combination with the compound rack H^4, and with means for reciprocating the rack intermittingly, as and for the purposes set forth.

15. In a machine for forming wire fabric, the twisting-pinions or revolving disks H^3, provided with the notches h^8 and the eyes h^7, in combination with the shifting plate K, constructed, as described, with inclined slots k^1 and circular holes k, as and for the purposes set forth.

16. In a machine for forming wire fabric, the shifting plate K, provided with the inclined slots k^1, holes k, and right-angled slots k^2, constructed and operated as and for the purposes set forth.

17. In a machine for forming wire fabric, the shaft H^5, provided with pinions b and b^2, in combination with the plates B, B^4 and C, and the rack H^4, as and for the purposes set forth.

18. In a machine for forming wire fabric, the draw-feed roller S, in combination with the rollers T and U, operating together as and for the purposes set forth.

In testimony that I claim the above I have hereunto subscribed my name in the presence of two witnesses.

ISHAM SEDGWICK.

Witnesses:
JAMES J. SHEEHY.
W. N. SEVERANCE.

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634

United States Patent Office.

ISHAM SEDGWICK, of Richmond, Indiana.

Wire-twisting Machine.

Specification forming part of Letters Patent No. 233,033, dated October 5, 1880. Application filed August 20, 1880. (No model.)

To all whom it may concern:

Be it known that I, Isham Sedgwick, a citizen of the United States, resident at Richmond, in the county of Wayne and State of Indiana, have invented certain new and useful improvements in wire-twisting machines; and I do hereby declare the following to be a full, clear and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

(Here follow diagrams marked pp. 623, 625, 627, 629, 631, & 633.)

This invention relates to machines for making twisted-wire fabrics; and it consists in certain improvements upon a machine for the same purpose described and shown in letters patent No. 218,323, granted to me August 5, 1879, which improvements will be hereinafter fully described, and particularly pointed out in the claims.

Figure 1 is a front elevation of a machine embodying the improvements in my invention. Fig. 2 is a sectional plan view taken below line 1 1 in Fig. 1. Fig. 3 is a sectional plan view taken between lines 2 2 and 1 1 in Fig. 1. Fig. 4 is a sectional plan view taken between lines 3 3 and 2 2 in Fig. 1. Fig. 5 is a detail view of a portion of the wire-shifters. Fig. 6 is a detail view of the perforated shifting-bar, its rack and pinion. Fig. 7 is an end view of the expansible reel, and Fig. 8 is a sectional detail view of a portion of the machine, showing the wires and the fabric formed therefrom. Fig. 9 is a view, in elevation, looking toward the side on which the mechanism for operating the rolls is located.

Referring by letter to the drawings, A designates the frame of the machine; B, the master-wheel, which revolves in a horizontal plane, is toothed in its periphery, and is provided on the upper face of its rim throughout half of its circumference with studs C, D, E, and F at intervals of forty-five degrees.

At the left-hand side of the frame is a short vertical shaft, G, supported in bearings G' G^2, and provided with an arm, H, and a tappet, I, secured thereto at angles of thirty degrees. On the right-

(No Model.) 6 Sheets—Sheet 1.

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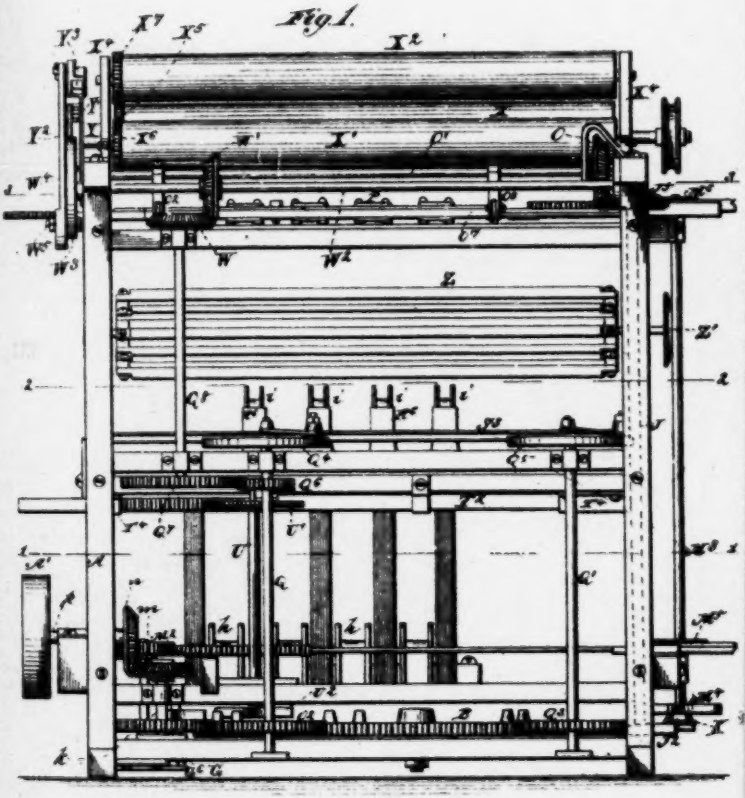
Wire Twisting Machine.

No. 233,033. Patented Oct. 5, 1880.

Fig. 1.



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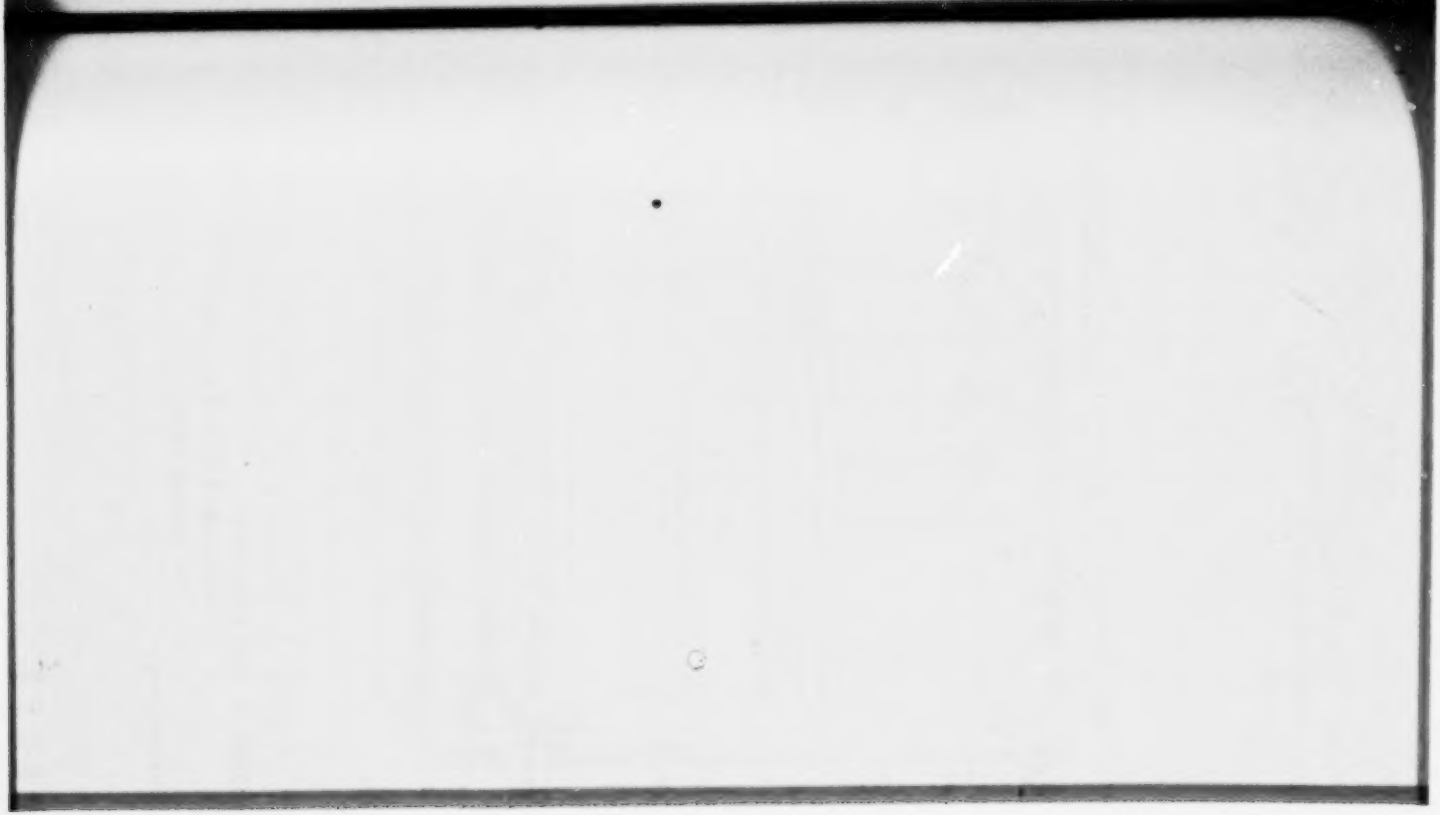

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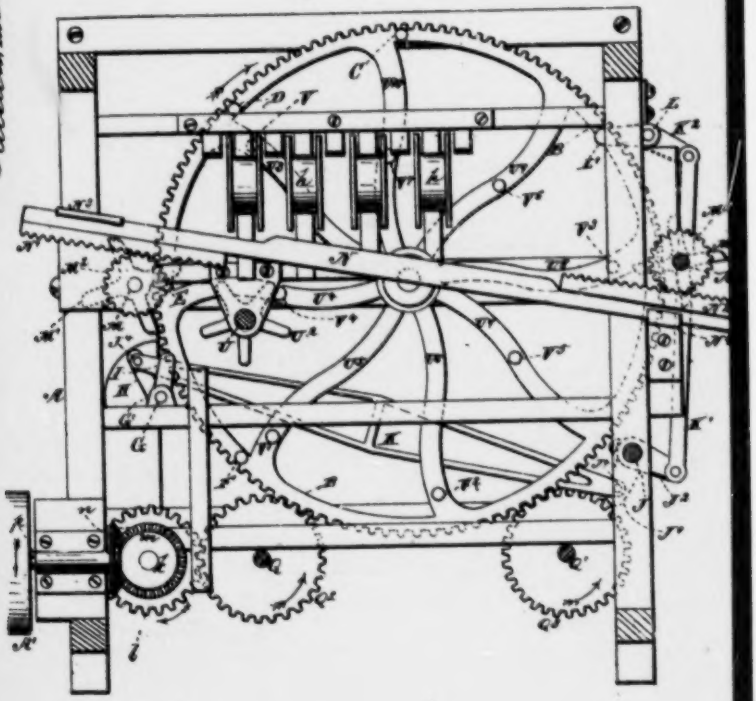
Wire Twisting Machine.

No. 233,033. Patented Oct. 5, 1880.

Fig 2.



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(No Model.) 6 Sheets—Sheet 3.

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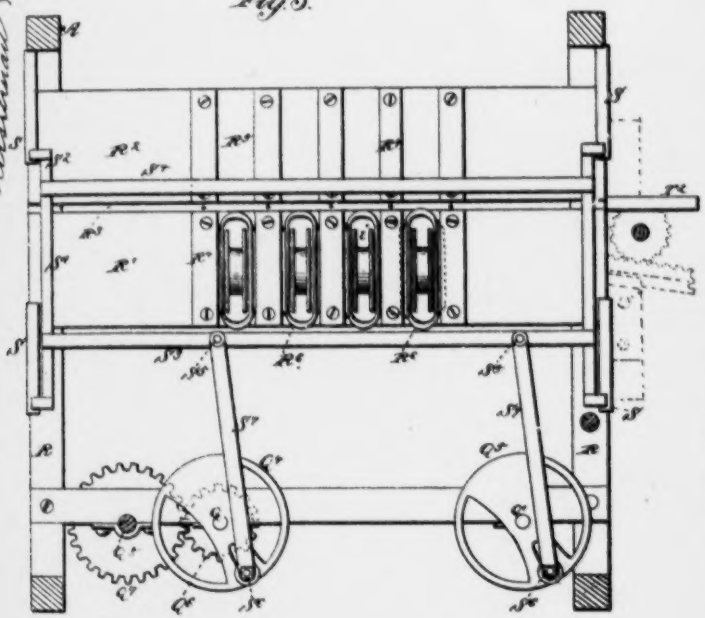
Wire Twisting Machine.

No. 233,033. Patented Oct. 5, 1880.

Fig 3.



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Wire Twisting Machine.

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Fig. 4.

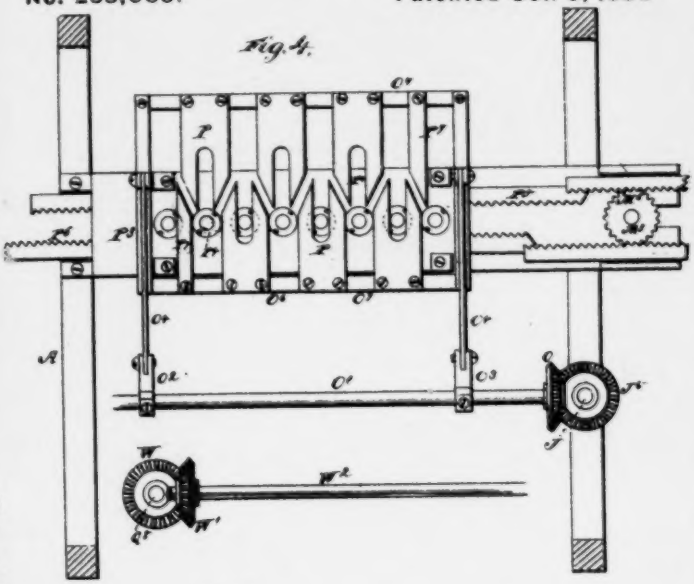


Fig. 5.

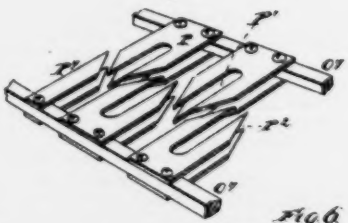
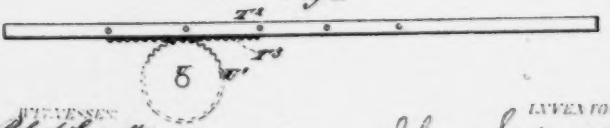


Fig. 7.

Fig. 6.



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(No Model.) 6 Sheets—Sheet 5.

I. SEDGWICK.

Wire Twisting Machine.

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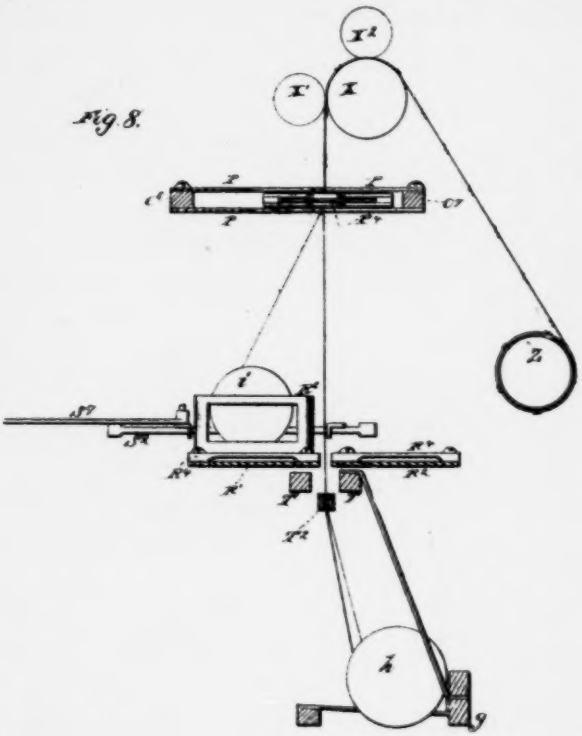
Fig 8.



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Wire Twisting Machine.

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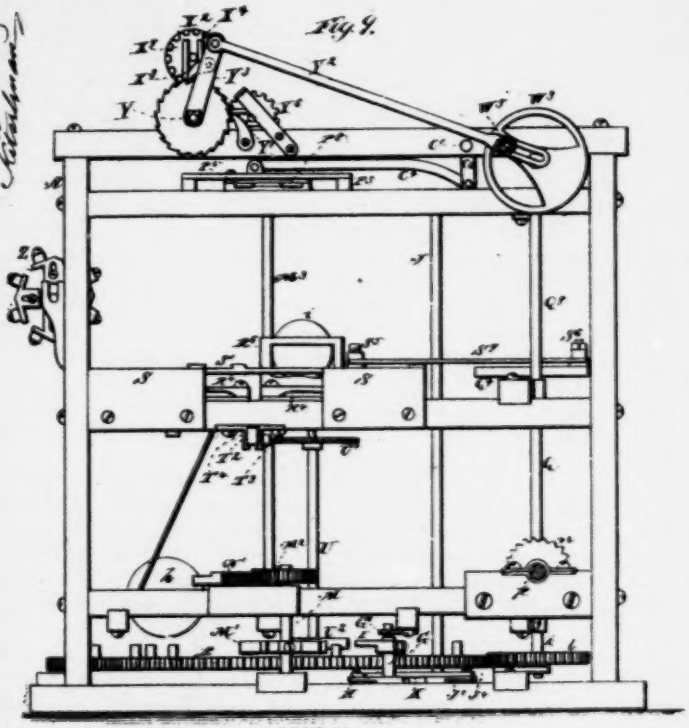
Fig. 9.



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hand side of the frame and nearer the front of the same is a vertical shaft, J, which extends from the bottom to near the top of the frame A, and is provided near its lower end with arms J′ J². The arms H and J′ have wrist-pins J⁴, and are connected by a pitman, K. The arm J² has a wrist-pin, and is connected by a rod, K′, to wrist-pin of an arm, K², upon a short vertical shaft, L, on the same side of, but near the rear of, the frame. The shaft L also has a tappet, L′, secured at an angle of sixty degrees to the arm K². On the left-hand side of the frame, and slightly in the rear of the short vertical shaft G, is another short vertical shaft, M, slightly longer than the shaft G, which is provided near its lower end with a four-pointed star-wheel, M′, and at its upper end with a pinion-wheel, M². At the other side of the frame A, and directly opposite the shaft M, is a long vertical shaft, M³, extending from the bottom to near the top of the frame A, provided near its lower end with a four-pointed star-wheel, M⁴, and a pinion, M⁵, corresponding in position with the star-wheel M′ and the pinion M² upon the shaft M. The long vertical shaft M³ is also provided at its upper end with a pinion, M⁶.

A rack-bar, N, having racks N′ N² on opposite edges at its ends, works in ways N³ N⁴, at opposite sides of the frame A, the racks engaging opposite sides of their respective pinions, as shown.

The upper end of the shaft J is provided with a horizontal miter-gear wheel, J⁵, which engages with a vertical miter-gear wheel, O, upon a horizontal shaft, O′, traversing the frame laterally between its girders. Arms O² O³ are keyed to the shaft O′, and are connected, by curved pivoted bars O⁴ O⁴, to the frame O⁶ of the wire-shifters P.

The wire-shifters P consist of plates slotted at P′ in their inner ends, and beveled at P² upon each side. These plates P are bolted in pairs to the upper and lower faces of the bars O⁷ of the frame O⁶, so that they embrace the bed P³, in which the wire-twisters P⁴ and their operating racks P⁵ P⁶ operate. Half-shifters P⁷ are necessary, one at each of two corners, at opposite ends of the frame O⁶, for convenience.

The construction and operation of the twisting-disks P⁴ and the racks for operating them are the same as those shown and described in my former letters patent, hereinbefore mentioned, except
635 that two rack-bars are used to operate the twisting-disk—viz., one on each side thereof, as shown—and the mechanism for driving the rack-bars is differently arranged. In this instance the pinion M⁶ on the long vertical shaft M operates the rack-bars P⁵ P⁶.

Outside of the master-wheel B, and near the front of the frame A, are arranged two vertical shafts, Q Q′, provided at their lower ends with pinions Q² Q³, the teeth of which engage the teeth of the master-wheel.

At the upper ends of the shafts Q Q′ are crank-wheels Q⁴ Q⁵, and beneath the crank-wheel Q⁴ on the shaft Q is a pinion, Q⁶, which engages a gear-wheel, Q⁷, on the lower end of a vertical shaft, Q⁸.

Upon the cross-beams R of the frame A are secured two flat plates, R′ R², placed parallel to each other, and having a space, R³, between their inner edges. Upon these plates R′ R² are secured metal cleats

R^4, made concave in their under faces, and beveled inward and downward at the edges, to form ways R^5, in which the flanged spool-carriers R^6 slide back and forth across the space R^3.

Flanged plates S are secured to the outer sides of the cross-beams R of the frame A, to form guideways for the carrier-frame S', composed of the grooved end bars, S^3, and the connecting side bars, S^4, between which the spool-carriers R^6 ride.

The carrier-frame S' is provided with studs S^5 upon its bar S^2, which are connected with the wrist-pins S^6 on the crank-wheels Q^4 Q^5 by pitmen S^7 S^7.

Beneath the plates R' R^2 bars T traverse the frame A, between the cross-beams R, and have a space between their inner edges which registers with the space R^3, between the inner edges of the plates R' R^2.

A perforated bar, T^2, having a rack, T^3, on its front edge and near one end thereof, works in ways T^4 T^4, secured to the under faces of the bars T, directly beneath the space R^3.

In front of the perforated rack-bar T^2 a vertical shaft, U, provided near its upper end with a gear-wheel, U', which engages with the rack T^3, is suspended in bearings, and provided at its extreme lower end with a five-pointed star-wheel, U^2.

The master-wheel B is provided with eight curved radial arms, U^3 U^4 U^5 U^6 U^7 U^8 U^9 U^{10}, the arms U^3 U^5 U^6 U^8 being provided, respectively, with studs V V' V^2 V^3, which travel, when the master-wheel B is revolved, in a circular path outside of the vertical shaft U, and strike the arms of the five-pointed star-wheel U^2 and cause it to turn in the same direction as the master-wheel B, which revolves in the direction of the arrow.

The arms U^4 U^7 U^9 U^{10} are provided, respectively, with studs V^4 V^5 V^6 V^7, which travel, when the master-wheel B is revolved, in a circular path inside of the vertical shaft U, and strike the arms of the five-pointed star-wheel U^2 and cause it to turn in a direction the reverse of that in which the master-wheel B is moving.

At the upper end of the vertical shaft Q^8 is a horizontal miter-gear, W, which engages with a vertical miter-gear, W', on a horizontal shaft, W^2, at the upper part of the frame A.

Upon the top of the frame A, and directly over the twisting-disks and wire-shifters, is arranged a system of three rollers, X X' X', supported in bearings X^4 X^4, and connected by gear-wheels X^5 X^6 X^7.

The shaft Y of the roller X projects beyond the end of the frame A, and is provided with a ratchet-wheel, Y', and an arm, Y^2, carrying on its inside a pivoted pawl, Y^3. A pivoted detent, Y^4, at the side of the frame A, also engages the ratchet-wheel Y'.

The outer end of the horizontal shaft W^2 carries a crank-wheel, W^3. A slotted pitman, W^4, pivoted to the upper end of the arm Y^2, connects with the wrist-pin W^5 on the crank-wheel W^3.

An expansible reel, Z, provided with a pulley, Z', is supported in bearings at the rear side of the frame A. This reel consists of a shaft, *a*, provided with cross-arms *b*, to which slotted plates *c* are secured by screws *d*. The slats *e* forming the reel are secured to the slotted plates *c*, two to each plate, as shown, and the reel is expanded

by turning nuts *f* upon the shaft *a*, so that the inner ends of the plates *c* will rest on the corners of the nuts. The wire fabric is wound upon the reel while in its expanded condition, and when the fabric is to be removed the nuts are turned to permit the reel to contract, when it can readily be slipped from within the roll of fabric upon it.

Near the rear of the frame, and beneath and in the rear of the perforated shifting-bar T^2, is located the spool-rack *g*, for carrying the supply-spools *h*, on which are wound the edge wires and a portion of the intermediate wires, of which the fabric is formed. The remainder of the intermediate wires are wound upon the supply-spools *i* placed in the spool-carriers R^6.

The wires from the spools *h* are passed up through the perforations in the shifting-bar T^2, through the space R^3 between the plates R' R', the edge wires passed through the eyes in the two outside twisting-disks, P^4, and the intermediate or mesh wires from both sets of supply-spools carried up and placed in the notches in the opposite sides of each alternate twisting-disk P^4, thence between the rollers X X', and between the rollers X X^2, and down around the reel.

At the left-hand front corner of the frame is a short vertical shaft, *k*, having a gear-wheel, *l*, at its lower end, which engages the gear-wheel Q^2, upon the shaft Q, and at its top with a horizontal miter-gear, *m*, which engages the vertical miter-gear *n* upon the inner end of the pulley-shaft *p*, through which motion is communicated to the machine.

The operation of the machine is as follows: Power being applied at the band-wheel A', is communicated, through the gear-wheels *n*, *m*, *l*, and Q^2, to the master-wheel B. Assuming the machine
636 to be in such a position that the studs C, D, E, and F on the rim of the master-wheel are nearest the front of the frame and between the star-wheels M' and M^4 when starting, the stud C will first strike one of the arms projecting inward from the star-wheel M' and turn it one-quarter revolution to the left, which operates the pinion M^2 at the top of the shaft M, and moves the rack-bar N to the left, which movement of the bar N causes the pinion M^5 at the opposite side of the frame to be turned to the left, and at the same time turns the pinion M^6 at the top of the shaft M^3, which operates the rack-bars P^5 P^6, which engage the twisting-disks P^4, and turns the twisting-disks to the right. The studs D, E, and F follow, and cause the parts above mentioned to be operated by each stud in like manner until the twisting-disks have made two revolutions to the right. The spool-carriers R^6 are, at the start, over the plate R', on the front side of the space R^3, the shifter-bar T^2 is at the limit of its movement toward the left of the machine, and the wire-shifters P are shifted to the rear limit of their movement. The stud C on the rim first strikes the arm of the star-wheel M', as above stated. The stud V on the arm U^2 then strikes the outer arm of the five-pointed star-wheel U^3, (the spool-carrier frame having in the meantime carried the spool-carriers R^6 across the space R^3, over to the plate R^1, through the pinions Q^2 Q^3, crank-wheels Q^4 Q^5, and arms S^7,) and the star-wheel U^3 makes one-fifth of a revolution to the right, and shifts the shifting-bar T^2 to the right. The stud D

then, and at about the same time, turns the star-wheel M′ one-fourth revolution to the left, the spool-carriers R^6 are drawn back across the space R^3, and the stud V^4 on the arm U^4 strikes the inside arm of the five-pointed star-wheel U^1, then in its track, and shifts the shifting-bar T^2 to the left. The stud E almost immediately thereafter strikes the arm of the star-wheel M′, then in its track, and turns said star-wheel M′ another fourth-revolution to the left. At the same time the spool-carriers R^6 are again shifted over the space R^3 to the plate R^1, and the stud V′ on the arm U^5 strikes an outer arm of the five-pointed star-wheel U^3, and causes the shifter-bar T to be shifted again to the right. The stud F immediately thereafter strikes the fourth arm of the star-wheel M′ and turns it again to the left, the stud C striking the tappet L′ just as the stud E leaves the star-wheel M′, and operating through the arm K^2, bar K′, arms J^2 J^4 on shaft J, pitman K, arm H, gearing J^5 and O, shaft O′, and arms O^3 O^4, to operate the shifting-plates P, causing them to shift the mesh-wires from the set of twisting-disks P^4, that they then occupy, to the notches in the opposite twisting-disks, and at the same time causing the tappet I to be turned inward to come in the track of the stud C. The stud C next strikes the inner arm of the star-wheel M^4 at the right-hand side of the frame A, and turns the star-wheel M^4 one-fourth revolution to the right, and carries the rack-bar N to right. The pinion M^6 at the top of the shaft M^3 is also turned to the right, and operates the racks P^5 P^6 in such a manner as to turn the twisting-disks P^4 to the left. The stud V^3 on the arm U^6 next strikes the outer arm of the five-pointed star-wheel U^3 and a second time shifts the shifting-bar T^2 to the right, its last movement having been in the same direction, which shifts said bar T^2 to its limit to the right. The spool-carriers R^6 are at this time shifted over the space R^3 to the plate R^1, and the stud V^5 on the arm U^7 now strikes an inner arm of the five-pointed star-wheel U^1 and shifts the shifting-bar T^2 to the left. The stud next follows, striking an arm of the four-pointed star-wheel M^4, which is again operated to the right, the twisting-disks turned to the left, and the spool-carrier drawn again to the front of the space R^3. The stud V^2 on the arm U^8 next strikes an outer arm of the five-pointed star-wheel U^2 and shifts the shifting-bar T^2 to the right, where it is a second time at its limit to the right. The stud E next strikes the star-wheel M^4, the spool-carriers R^6 are shifted to the plate R^1, and the stud V^6 on the arm U^9 strikes an inner arm of the five-pointed star-wheel U^3 and shifts the perforated bar T^2 to the left. The stud F strikes the star-wheel M^4, turns it the fourth time to the right, the spool-carriers R^6 are returned to the plate R′, the stud V^7 on the arm U^{10} strikes the inner arm of the star-wheel U^3 and shifts the bar T^2 to the left to its place of beginning, as herein described, and the stud C strikes the tappet I, throws the tappet L′ in the track of the stud C, and shifts the shifters P to the rear of the frame, where they started.

The foregoing describes the operation of the mechanism, except the rollers and reel, during one complete revolution of the master-wheel B. The rollers are operated during this time by the pawl to

press the fabric between them, and the reel is operated to wind it up as it comes from the rollers. The reel is operated by a band leading from a pulley on the shaft of the roller X.

The fabric formed on this machine is similar to that formed on my former machine described in the letters patent hereinbefore mentioned, and it consists of a fabric having edge-wires and diamond-shape mesh-work, and tension-wires in the mesh-work, if needed. The twisting-disks are the same and operate in the same manner.

The shifting-plates P being placed in pairs, one plate of a pair being above and the other below the twisting-disk, the wires are shifted from one set of disks to the other and back again with greater regularity and precision than where only an upper set of shifters are used, as in my former machine.

Having thus fully described my invention, what I claim as new, and desire to secure by letters patent, is—

1. In a wire-twisting machine, the perforated shifting-bar T^2, provided with the rack T^3, supported in ways beneath the space R^3, in combination with the shaft U, carrying the pinion 637 & 638 U′ at its upper end and the five-pointed star-wheel U^2 at its lower end, and the master-wheel B, provided with studs V, V′, V^2, V^3, V^4, V^5, V^6, and V^7, constructed and operated substantially as and for the purposes set forth.

2. In a wire-twisting machine, the plates R′ R^2, provided with cleats R^4, and having the space R^3 between their inner edges, in combination with the carrier-frame and flanged spool-carriers R^6, the arms S^7 S^7, crank-wheels Q^4 Q^5, and shafts Q Q′, provided with gear-wheels Q^2 Q^3 at their lower ends, and operated by the master-wheel B and gear-wheel *l*, substantially as and for the purposes set forth.

3. In a wire-twisting machine, the wire-shifters P, slotted at P′ and beveled on both sides, as at P^2, and secured in pairs to the upper and lower faces of the bars O^7 O^7 of the shifting-frame, in combination with the twisting-disks P^4, the curved bars O^4, arms O^3 upon the shaft O′, provided with the gear-wheel O, and the shaft J, provided with the gear J^5, and arms J^2 J^4, connected with the shafts L and M, provided with the tappets I and L′, by the pitmen K K′, and operated by the stud C upon the master-wheel B, substantially as and for the purposes set forth.

4. In a wire-twisting machine, the rollers X X′ X^2, connected by gear-wheels X^5 X^6 X^7, and supported in bearings above the wire-twisting disks P^4, in combination with the ratchet-wheel Y′, pivoted pawl Y^2, pivoted to the arm Y^3, the slotted pitman W^4, secured to the wrist-pin of the crank-wheel W^3 upon the end of the shaft W^2, the shaft W^2, having gear W′, the vertical shaft Q^8, having miter-gear W at its top and gear Q^7 at its bottom, and the shaft Q, geared to the shaft Q^8 and to the master-wheel B, all constructed and operating substantially as and for the purposes set forth.

5. In a wire-twisting machine, the expansible reel Z, having its slats fixed to slotted sliding plates secured to cross-arms upon the shaft of the reel, and operated by central nuts *f* to expand and con-

tract the circumference of the reel, substantially as and for the purposes set forth.

6. In a wire-twisting machine, the combination of the shifting-bar T^2, the reciprocating spool-carriers R^6, the twisting-disks P^4, and the shifting-plates P, and the operating mechanism herein described, substantially as and for the purposes set forth.

In testimony whereof I affix my signature in presence of two witnesses.

ISHAM SEDGWICK.

Witnesses:

THADDEUS WRIGHT.
WILLIAM BAXTER.

17123

2 Sheets—Sheet 1.

J. AYRES & A. C. DECKER.

Machine for Barbing Wire.

No. 235,331. Patented Dec. 14, 1880.

Fig. 3.

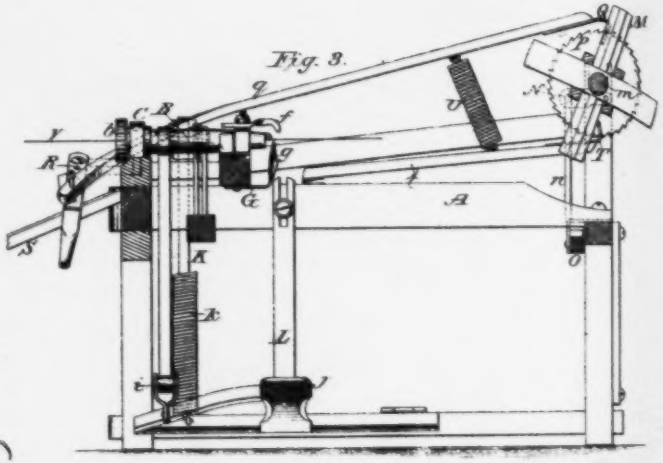
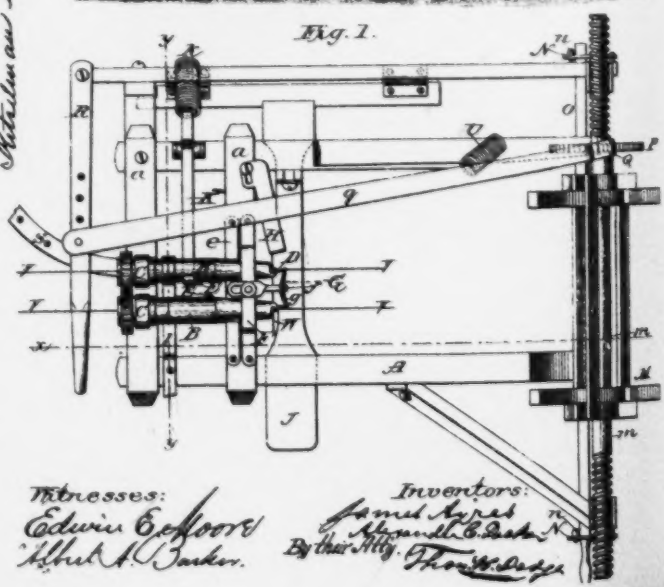


Fig. 1.



No 1408 Kokomo Co vs Antisdel et al

Witnesses:
Edwin E. Moore
Albert A. Parker.

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Samuel Ayres
Alexander C. Decker
By their Atty. Thos. W. Dodge

17124

2 Sheets—Sheet 1.

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Fig. 2.

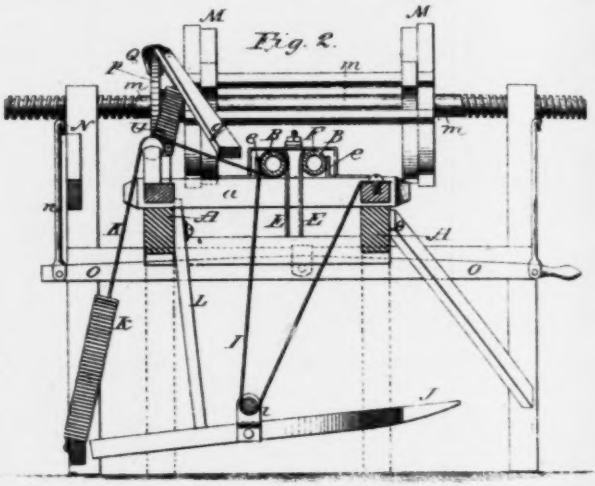


Fig. 5.

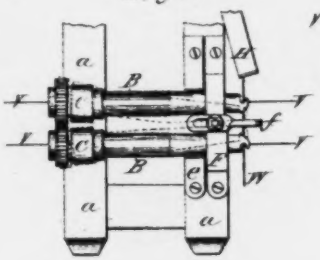


Fig. 6.

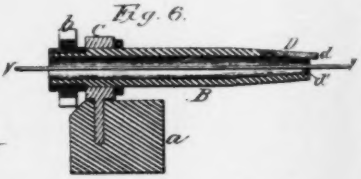


Fig. 4.

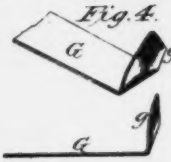
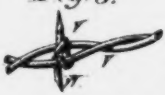


Fig. 7.

Fig. 8.



Witnesses:
Edwin E. Sorrell
Albert A. Barker.

Inventors;
James Ayres
Alexander C. Decker
By their Att'y Thos. H. Dodge

642 United States Patent Office.

JAMES AYRES and ALEXANDER C. DECKER, of Bushnell, Illinois, assignors to Washburn & Moen Manufacturing Company, of Worcester, Massachusetts.

Machine for Barbing Wire.

Specification forming part of Letters Patent No. 235,331, dated December 14, 1880. Application filed June 14, 1879.

To all whom it may concern:

Be it known that we, James Ayres and Alexander C. Decker, of Bushnell, in the county of McDonough and State of Illinois, have invented certain new and useful improvements in machines for barbing wires, which are fully described in the following specification, reference being had to the accompanying drawings, in which—

(Here follow diagrams marked pp. 639 & 641.)

Figure 1 represents a plan view of a barbing-machine embodying our improvements. Fig. 2 represents a transverse section of the machine, taken on line *y y*, Fig. 1; Fig. 3, a longitudinal section of the same, taken on the line *x x*, Fig. 1. Fig. 4 represents enlarged views of portions of the barbing device, as will be hereinafter more fully described; Fig. 5, a detail plan view on an enlarged scale, showing the barbing-mandrels; Fig. 6, a longitudinal section of one of said mandrels on an enlarged scale; Fig. 7, a side elevation of one of the mandrel-tips detached and on an enlarged scale; and Fig. 8, a section of wire with the barb applied, showing the kind of barb made by this machine.

Our invention relates to a machine for applying to fence-wires the peculiar kind of barb described and shown in a prior application for patent filed by Alexander C. Decker; and the object of the invention is to provide a machine by which the said barb may be applied to the wires automatically. This barb is applied to two wires, the respective ends of the barb being wound once or more around each of the main wires respectively.

The invention consists in a pair of tubular mandrels, through which the main wires are passed, and they are provided with hooks at their tips, by means of which the ends of the barb are caught and wound around the main wires.

It also consists in mounting the mandrels in pivotal bearings at their outer ends, whereby the inner ends are permitted to be drawn together as the ends of the barb are wound about the main wires.

It also consists in various devices and combinations of devices, all

of which will be hereinafter fully described, and will be definitely pointed out in the claims.

In the drawings, A represents the main or supporting frame of the machine, on which the various operating devices are mounted. On the upper part of this machine, on cross-beams *a*, are two tubular mandrels, B, the outer ends of which are mounted in bearings C, which are attached to the outer cross-beams *a* by pivotal supports, as shown in Fig. 6 of the drawings, whereby the mandrels may be vibrated so as to bring their inner ends together or separate them, as may be required. The inner ends of these mandrels are provided with tips D, which are also tubular and attached to the ends of the mandrels by screw-threads or any other suitable means. These tips are mere shells, and their outer ends are closed by steel plugs *d'*, which are drilled sufficiently large to admit the wires to be passed through, and which furnish a hard bearing for the wires as the mandrels are revolved. The two mandrels are arranged side by side, as shown in Fig. 5 of the drawings, and the two curved or hooked lugs on their inner tips are arranged opposite to each other, or, in other words, curved in an opposite direction to each other, as also shown in Fig. 5 of the drawings. A pinion, *b*, is mounted on the outer end of each mandrel, the two pinions meshing together.

A spring or springs, E, are attached to the frame and arranged between the mandrels, so as to operate to separate their inner ends. This may be either a single bent spring or there may be independent springs, each one operating upon one of the mandrels. On the inner beam *a* two stops, *e*, are arranged on the outside of each of the mandrels, being placed so as to limit the outward vibration of the mandrels under the action of the spring E, so that they are always stopped in the required position. A keeper, F, is also mounted on this same cross-beam, and extends over the mandrels to hold them in place. This keeper also furnishes a support for a guide or stop, *f*, which is attached thereto by a slot and set-screw, and projects inward a little beyond the inner ends of the mandrels, and has its ex-
643 treme end bent downward and inclined slightly outward, as shown in Fig. 3 of the drawings.

A cam-guide, G, is attached to the under side of the inner cross-beam *a* and projects inward therefrom, its end being bent upward, as shown in Fig. 3 of the drawings. This projection *g* is pointed, and its extremity is arranged to stand between the ends of the mandrels about on a line with their faces. The outer edges of the projection *g* are bent or turned outward from the upper point downward, so that the projection itself is somewhat convex upon its inner face and correspondingly concave upon its outer face.

A gage, H, is arranged on the back side of the inner mandrel, being attached to the inner cross-beam *a* so as to be adjusted back and forth, and is intended to regulate the position of the barbs when placed on the wires, as will be presently described.

The motion of the mandrels required to perform the desired operation is a rotation first in one direction, whereby the barbs are fastened on the main wires, and then in the opposite direction to return them to their proper position of rest. Any suitable mechanism may

be employed to produce these movements. We have shown in the drawings a device for accomplishing this, which consists of a strap, I, wound at one end around one of the mandrels, and fastened at the other end to a treadle, J, and carried around a pulley, *i*, on said treadle, and extended up thence and fastened to the frame. When the treadle is depressed it will, of course, rotate the mandrel around which the band is wound, and this, being geared to its companion mandrel, will consequently revolve the latter in an opposite direction. Another strap, K, is wound around the mandrel in an opposite direction to the strap I, and is attached to a spring, *k*, at its outer end, which, in turn, is fastened to the frame. This second strap and spring, it will be seen, will operate in a well-known way to reverse the revolution of the mandrels and return them to their position. The retracting strap and spring may be arranged in any position on the machine which may be found most convenient and practical. The mandrels must stop with the hooked lugs uppermost, as shown in Fig. 2 of the drawings, and it is therefore necessary to provide some means to limit their backward rotation. This we have accomplished by arranging a stop-bar, L, just above the treadle, which limits the upward vibration of the latter, and so stops the return revolution of the mandrels at the proper point. This bar may be made adjustable to regulate the revolution of the mandrels as may be required.

As the barbs are applied to the wire the latter, of course, must be disposed of, and this we accomplish by winding it upon a reel, M, attached to the shaft *m*, mounted in bearings at the end of the machine opposite to the mandrels. On one end of the reel-shaft a right-hand screw-thread is cut, and on the other end a left-hand thread.

A switch, N, is pivoted to each of the standards, supporting the reel-shaft just below the said shaft, so as to engage, respectively, with the screw-threads cut on the ends of the latter, and the link-rod *n* is pivoted to the free end of each of these switches and attached to one end of a lever, O, pivoted at its center to the main frame.

The length of the link-rod *n* is such that when one end of the lever O is thrown up to bring one of the switches into engagement with the screw-thread on the reel-shaft the other switch at the other end of the said shaft will be disengaged. It will be seen from this description that one of the switches will operate, in connection with one of the threaded ends, to cause the reel to travel in one direction, and the other in the other direction, so that by means of these switches and the vibrating lever O the desired travel of the reel is obtained and reversed as necessary to wind the wire regularly upon the reel.

A ratchet-wheel, P, is fastened to the reel-shaft, and a pawl, Q, is arranged to engage with the ratchet-teeth on the upper edge of the wheel. A shaft, *q*, attached to this pawl, extends to the other end of the machine, where it is pivoted to a hand-lever, R, which, in turn, is pivoted to the frame of the machine outside of the mandrels. The vibration outward of this lever will, of course, pull on the pawl and turn the ratchet-wheel and reel a certain distance. This distance is

regulated by suitable stops on a segment, S, arranged just below the lever R.

A stop-pawl, T, is arranged to engage with the ratchet-wheel below, and is provided with a shaft, *t*, which is hinged to the main frame.

A spring, U, connects the two pawl-shafts, and causes the pawl to engage with the ratchet-wheel, but at the same time permits the required yielding movement to allow the pawls to pass over the ratchet-teeth when necessary.

The operation of the machine is as follows: A main wire, V, is passed through each of the tubular mandrels. It will be understood, of course, that these wires are fed from spools or reels conveniently arranged with reference to the machine, but which it is not necessary to show here. The barbs, W, to be fastened to the wires, are straight pieces of round wire cut on a bevel. The ends of the main wires are drawn through the mandrels, and will therefore be in the position shown in Figs. 1 and 5 of the drawings. A barb, W, is laid upon the main wires just beneath the bent lugs on the inner ends of the mandrels, as shown in Fig. 5 of the drawings. The treadle is in a depressed condition, which rotates the mandrels, as above described, when it is evident that the hooked lugs will catch the respective ends of the barb and carry them around the
644 respective wires V. The edges of the lugs are sharp, so as to bite the barb and prevent slipping, and therefore the barb is wound around the main wires from the point of contact with the lugs inward, or, in other words, the central portion of the barb is wound around the wires, and not the outer ends. This will, of course, continually throw the barb between the two main wires, which is accommodated by the yielding of the inner ends of the mandrels, which are gradually brought together, and when the attachment of the barb is completed will be closed together, as shown in dotted lines in Fig. 5 of the drawings.

If there were nothing to prevent, the outer ends of the barb would be brought together below the mandrels, and the completion of the coil prevented. This is obviated by the cam-guide G. The ends of the barb, as they are carried around by the mandrels, strike against the flaring edges of this cam and are bent inward, so as to pass each other and permit the coiling of the barb around the main wires to be completed. At the same time the depending projection on the end of the gage *f* takes the body or central portion of the barb and prevents it from springing outward and upward. When a single revolution of the mandrels is completed the barb will be wound around each of the main wires independently, and at the same time the wires drawn close together, presenting the appearance shown in Fig. 8 of the drawings. The treadle is then released and the mandrels are retracted, and at the same time the lever R is moved, rotating the reel and winding the wires thereon, at the same time feeding them the proper distance for the application of another barb.

It will be readily understood that if it is desired to wind the barb more than once around each of the main wires, it is easily accomplished by arranging the parts so as to give more than one revolu-

tion to the mandrels, and provide for a sufficient length of barb itself to accommodate the double coil.

It will be understood that the barbs are attached to the main wires in this operation without twisting the latter, which operation we propose to perform on another machine, though twisting mechanism may also be applied to this machine, so as to accomplish the entire operation of barbing and twisting upon the same machine.

In a machine constructed as above described the mandrels have an oscillating movement, but with suitable modification in the form of the coiling-lugs, the revolution of these mandrels may be made continuous, and may be driven automatically, by gearing or otherwise, continuously, instead of being operated by a treadle.

Mechanism may also be attached to the machine for cutting off the barbs, in which case mechanism should also be provided for feeding the barbed wire automatically to the machine.

All of these operations have been accomplished by devices shown in prior patents, which may be applied to this machine without difficulty, and when so applied our machine would be rendered automatic throughout.

Some of the minor devices which have been described above may, of course, be modified, and well-known equivalents substituted therefor, and we do not therefore confine ourselves to all of the specific devices and the specific construction and arrangement of devices which we have described above and shown in the drawings, provided always the main characteristics of our invention are retained.

Having thus described our invention, what we claim as new, and desire to secure by letters patent, is—

1. In a machine for barbing wire, two tubular mandrels, arranged parallel to each other, through which the main wires are passed, and provided with a coiling-lug on the tip end of each, in combination with mechanism for rotating the mandrels outwardly from each other and mechanism whereby the mandrels are permitted to move toward each other at their tip ends as the coiling proceeds, substantially as and for the purposes set forth.

2. The tubular mandrels B for the main wires, in combination with the pivotal bearings C, in which the outer ends of the mandrels are mounted, the coiling-lugs *d* on the inner ends of the mandrels and turned outward from each other, the spring or springs E, stops *e*, and pinions *b*, substantially as described.

3. The coiling-lugs *d* on the tip ends of the mandrels, curved as described, and provided with a sharp edge to take hold of the barb-wire, substantially as described.

4. The detachable tips D, provided with coiling-lugs *d*, in combination with the mandrel proper, substantially as described.

5. The tubular mandrels B, provided with the coiling-lugs *d*, in combination with the cam-guide G, the edges of which are inclined and flaring, whereby the ends of the barb are turned inward to pass each other as they are carried around by the coiling-lugs, substantially as described.

6. The gage *f*, having its outer end bent downward and inclined

or beveled, as described, for guiding and holding the central portion of the barb, substantially as set forth.

7. The mandrels B, geared to each other, as described, in combination with the driving-strap I, treadle J, and elastic retracting-strap K, substantially as described.

8. In a wire-barbing machine, the combination, with mechanism for properly supporting the main wires and feeding them forward at stated intervals, of treadle J, provided with pulley *i*, strap I and its attached mandrel, and stop-bar L, substantially as and for the purposes set forth.

9. In a machine for barbing wire, the combination, with take-up reel M and its shaft *m*, provided with right and left hand screw-threads, of a switch, N, pivoted as described, with means for operating the same, and link-rod *n*, substantially as and for the purposes set forth.

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10. The reel-shaft *m*, threaded as described, in combination with the pivoted switches N, link-rods *n*, and centrally-pivoted lever O, substantially as described.

11. The combination, with arm *q* and pawl Q, of lever R, spring U, segment S, provided with a stop, and hinged bar *t*, provided with hook T, said parts being constructed and arranged in relation to each other substantially as and for the purposes set forth.

12. The process herein described of coiling a single barb to each of two main wires by coiling it independently to each, consisting in laying the barb across the main wires, arranged parallel to each other, seizing the barb at each end by a coiling device, which prevents slipping, and then coiling the barb around each of the main wires from the ends inward, while at the same time the main wires are gradually permitted to approach each other, substantially as described.

JAMES AYRES.
ALEXANDER C. DECKER.

Witnesses:

JOSEPH B. McCONNELL.
GEORGE W. FOX.

(No Model.)

F. W. BRAINERD.

WIRE BARBING MACHINE.

No. 277,451. Patented May 15, 1883.

Fig. 1.

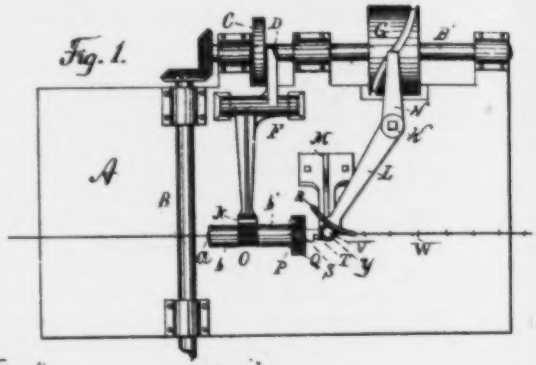

Fig. 4.

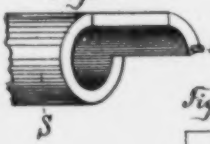

Fig. 2.

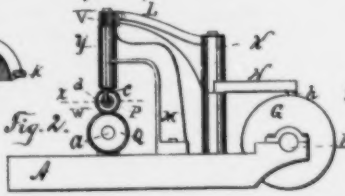

Fig. 3.

Fig. 5.

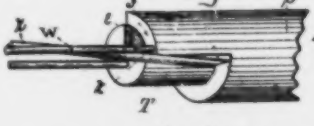

Fig. 6.

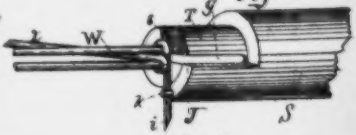

Fig. 8.

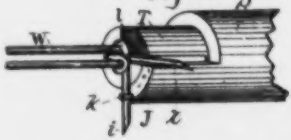

Fig. 7.

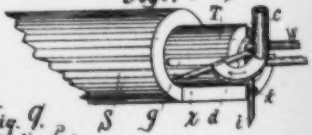

Fig. 9.

WITNESSES:

Wallace Greene

Orrin Taylor

INVENTOR

Frank W. Brainerd

by Robt. H. Wilkes

ATTORNEY

United States Patent Office.

FRANK W. BRAINERD, of Freeport, Illinois.

Wire-barbing Machine.

Specification forming part of Letters Patent No. 277,451, dated May 15, 1883. Application filed April 6, 1883. (No model.)

To all whom it may concern:

Be it known that I, Frank W. Brainerd, a resident of Freeport, in the county of Stephenson and State of Illinois, have invented certain new and useful improvements in wire-barbing machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention is an improved mechanism for wrapping wire barbs upon the main strands of a fence-cable.

The construction of the device is fully explained in the following specification and shown in the accompanying drawings, in which—

(Here follows diagram marked p. 647.)

Figure 1 is a plan of the entire machine; Fig. 2, a front elevation of the wrapping device; Fig. 3, a perspective view of the stationary slotted spindle through which the main wires are fed forward; Fig. 4, a perspective view of the shell which surrounds said spindle and rotates thereon; Figs. 5 and 6, perspective views of said sleeve and spindle and the main and barbed wires in two successive steps in the formation of a barb; Fig. 7, a perspective view of same parts and finger *d* in position to tuck the barb-wire through the slot in the stationary spindle; Fig. 8, a perspective view of the sleeve, spindle, and main and barb wires after the barb-wire is tucked through the slot by the finger *d*; and Fig. 9, a side elevation of the wrapping sleeve, spindle, and gearing connected therewith.

In these drawings, A is the bed of the machine; B, the driving-shaft thereof, and B′ a side shaft connected with the driving-shaft by miter-gears. An internal cam, C, rigidly attached to the shaft B′, imparts reciprocal vertical motion to a segmental gear, N, and a second cam, G, imparts reciprocal horizontal motion to a segmental gear, R. The centers about which these segments move and the bearings in which they are journaled are fully shown, and their motion is evident.

To the bed are rigidly attached, in a line parallel to the side shaft,

B′, two vertical posts or supports, *b b′*, and in these posts, at a short distance above the bed, is journaled a shaft, *a*.

Between the posts *b b′* a pinion, O, is rigidly attached to the shaft *a*, and engages with the segmental gear N, so that the reciprocal vertical motion of the segment produces reciprocal rotary motion of the pinion.

In front of the post *b′* a second pinion, Q, of a diameter double that of the pinion O, is also rigidly attached to the shaft *a* and turns with it.

Above the pinion Q is a horizontal cylindrical spindle, T, formed integrally with the post *b′*, and extending forward beyond the front face of pinion Q, and on the spindle T is mounted a sleeve, S, carrying a rigidly attached pinion, P, which meshes with the pinion Q immediately below it. The diameter of the pinion P being one-half that of the pinion Q, the speed of revolution of the sleeve S is double that of the shaft *a*. The post *b′* and spindle T are pierced by two longitudinal perforations, *f f′*, Fig. 3, for the passage of the main wires to be barbed, and between said perforations is a horizontal slot, *g*, of a thickness slightly greater than the diameter of the barb-wire, and of sufficient depth to permit the tucking through it of one end of the barb, as hereinafter described.

In the face of the spindle is a recess, *e*, covering a sector of ninety degrees of the face, and having a depth equal to the diameter of the barb-wire, one of the limits of said recess being the horizontal slot *g* and the other the shoulder *l*, Fig. 8. The face of the sleeve S is flush with the face of the spindle T; but three-fourths of its circumference is cut back to a distance equal to the depth of the slot *g*, leaving only a segment of ninety degrees flush with the face of the spindle. A wrapping-pin, K, is rigidly attached to said segment J.

In front of the sleeve and spindle is a vertical bearing, Y, formed integrally with its support M, and in the bearing rotates a spindle, to whose upper end is rigidly attached a pinion, V, which meshes with the geared segment R, whose reciprocal horizontal motion has already been described. At the lower end of the vertical spindle is an eccentric rod, *c*, Figs. 2 to 7, formed integrally therewith, and this rod terminates at the lower end in a horizontal curved finger, *d*, which lies in the plane of the slot *g* in the spindle T, is practically of the same thickness as said slot, and is so situated that the rotation of the rod *c* will pass it through said slot.

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From the description of the various parts of the machine shown it is evident that the rotation of the shaft B′ will impart reciprocal rotary motion to the sleeve S and the vertical spindle which carries the rod *c*, and that the rotation of the vertical spindle will carry the finger *d* through the slot *g*. It is equally plain that the driving-cams C G may be so formed and arranged upon the shaft that the various motions of the barb-forming parts shall succeed each other in any desired order.

The operation of the parts in forming the barb to whose manufacture this machine is adapted is as follows: The spindle T and sleeve S being in the position shown in Fig. 5, and the main wires W being stationary in the perforations in said spindle, the barb-wire *x* is fed

forward by suitable mechanism, passing between the main wires at right angles thereto, and immediately under the wrapping-pin K in the face of the sleeve S. The sleeve is then rotated in the direction indicated by the arrow in Fig. 5, through an angular space of four hundred and fifty degrees, or one and one-fourth revolutions, to the position shown in Fig. 6. The barb is then severed between the feeding mechanism and the main wires, and the form of the barb after such separation is shown in Fig. 7, which is the same as Fig. 6, except that it is reversed in order to show clearly the position of the rod *c* and finger *d* in relation to the barb. From the position shown in Fig. 7 the rod *c* is rotated one hundred and eighty degrees in the direction indicated by the arrow, carrying the finger *d* through the slot *g*, and bringing the end *x* of the barb into the position shown in Fig. 8. A reverse movement of the rod *c* withdraws the finger *d*, and the rotation of the sleeve S in the direction of the arrow in Fig. 8 through an arc of ninety degrees brings the point *x* into a vertical position against the shoulder *l*, makes the points parallel, and completes the barb. The main wires are then fed forward through a space equal to the distance between two adjacent barbs, when all the barb-forming parts are in the same position shown in Fig. 5, and are ready for the making of a second barb.

In the drawings no mechanism is shown for feeding the wires or for severing the barb-wire, these devices being well known and substantially the same in all wire-working machinery. The means shown for rotating the barb-forming parts are also well-known mechanical expedients. No novelty is claimed for them, nor are they material to the working of those parts of the machine which are believed to be new, as they may be readily replaced by other means equally simple and practical.

Having, however, described my invention, what I claim as new, and desire to secure by letters patent, is—

1. In a wire-barbing machine, a stationary spindle longitudinally perforated for the passage of two main wires, and slotted between said perforations to permit the tucking through it of the end of a barb formed on said wires, in combination with means, substantially as described, for tucking the end of the barb through said slot.

2. The combination of a stationary spindle longitudinally perforated for the passage of two main wires, and slotted between such perforations to permit the tucking through it of the end of a barb formed on said main wires, a sleeve rotating on said spindle and provided with a wrapping-lug in its face, and means, substantially as shown, for tucking the end of said barb through said slot.

3. The combination of a stationary spindle longitudinally perforated for the passage of two main wires, and slotted between such perforations to permit the tucking through it of the end of a barb formed on said wires, means for wrapping the barb about said wires, a tucking-finger lying in the plane of said slot, and means, substantially as described, whereby the said finger may be rotated through said slot, for the purpose of tucking through it the end of said barb.

4. The stationary spindle T, perforated and slotted, as shown, and having in its face the recessed sector *e* and shoulder *l*, in combina-

tion with the sleeve S and lug K, thereto attached, the rod *c* and finger *d*, formed integrally therewith, and means, substantially as described, for imparting reciprocal rotary motion to said sleeve S and rod *c*.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

FRANK W. BRAINERD.

Witnesses:

R. H. WILES.
OSCAR TAYLOR.

1101

(Model.) 2 Sheets—Sheet 1.

J. M. FULTZ.

UPRIGHT WIRE FENCE MAKING MACHINE.

No. 298,368. Patented May 13, 1884.

Fig. 1.

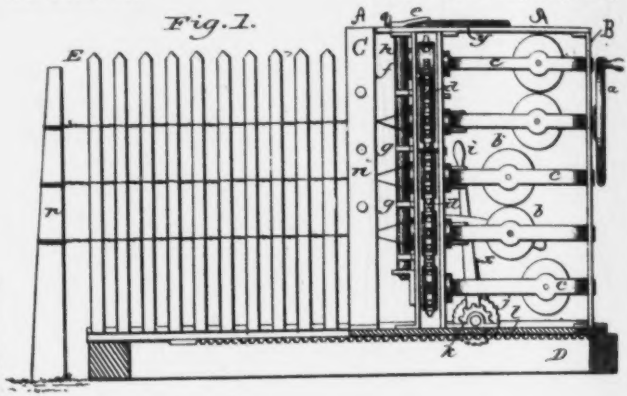


Fig. 2.

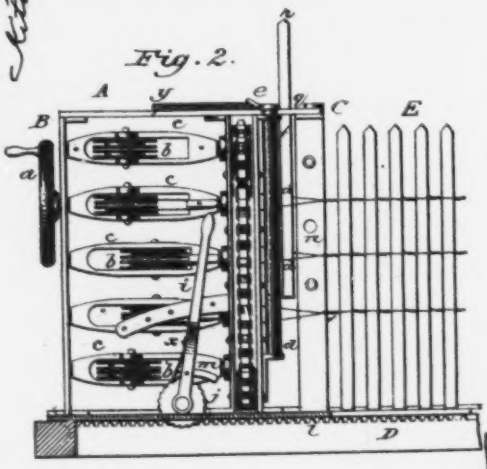
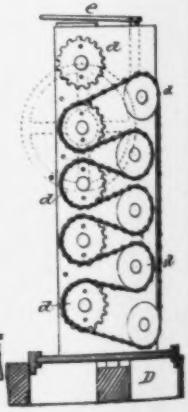


Fig. 3.



Witnesses:
David Stern
Louis Ehrt

Inventor:
John M. Fultz

(Model.) 2 Sheets—Sheet 1

J. M. FULTZ.

UPRIGHT WIRE FENCE MAKING MACHINE.

No. 298,368. Patented May 13, 1884.

Fig. 4.

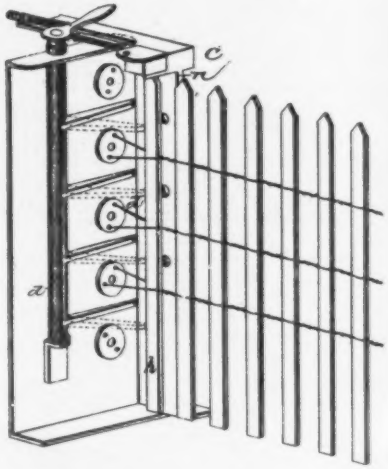
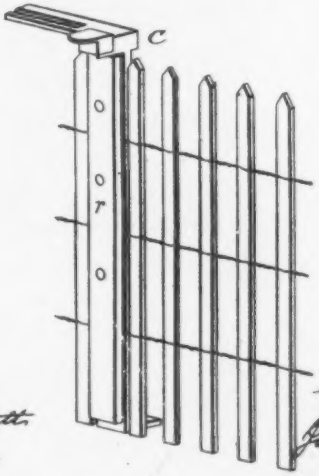


Fig. 5.



Witnesses:
Chas. McDevitt
Charles Stern

Inventor:
John Mann Fultz

654

United States Patent Office.

JOHN MANN FULTZ, of Quincy, Illinois.

Upright Wire-fence-making Machine.

Specification forming part of Letters Patent No. 298,368, dated May 13, 1884. Application filed November 16, 1883. (Model.)

To all whom it may concern:

Be it known that I, John Mann Fultz, of Quincy, in the county of Adams and State of Illinois, have invented a new and useful upright wire-fence-making machine, as well as certain parts thereof, which invention is fully set forth in the following specification and accompanying drawings, to wit:

(Here follow diagrams marked pp. 651 & 653.)

Figure 1 is a front elevation (the base of the frame being in section) of a machine embodying my improvements, in connection with a section of woven fence. Fig. 2 is a rear elevation (the base being shown in section) of the same showing a picket partially introduced between the wires. Fig. 3 is a transverse sectional view showing the sprocket-chain and sprocket-wheels and plain wheels over which the sprocket-chain passes to operate the twister-shafts. Fig. 4 is a sectional perspective view of the machine, showing the vertical shaft *d*, its arms, spring, and lever for forcing a picket to place when introduced between the wires; and Fig. 5 is a perspective detail view showing the board *r*, having the pins for holding the section of fence in place when the wires are being tightened preparatory to securing the section of fence to the posts.

In Figs. 1 and 2, A, B, and C are the upright frame of machine.

D is the base of machine—a frame sixteen feet long and about three feet wide, made of timbers of any desired size.

E is a section of fence with post.

a is a crank.

b b b b b are bobbins on which wire is wound.

c c c c c are open convex revolving shafts in which bobbins *b b b* work.

d d d is a system of chain-wheels, pulleys, and endless chain, (same as in Fig. 3.)

e is a lever attached to upright rod *f*, rod *f* having four arms, *g g g g*, by means of which a picket, when in position, is pressed to its place, ready to receive twist of wire, and the lever is again drawn back to its position by wire spring *y*.

h in Fig. 2 represents picket partly inserted, while in Fig. 4 it is dropped to position, ready to be pressed to place by movement of lever *e*.

i is a ratchet-lever, working upon ratchet-wheel *j*, attached to cog-wheel *k*, on which lever is a small spring, *x*.

l is a toothed rack extending through the center and the length of frame D, in which cog-wheel *k* works.

m is a small spring-pawl dropping into notches of wheel *j*, by means of which the upright part of machine is prevented from being drawn backward by weight of fence or tension of wire.

n is a post of the frame, having three holes, *o o o*. Over *n* is placed a board of equal length, having three pins, which are inserted in the holes *o o o*, and this is used for the purpose of tightening a section of fence when it is desired to fasten the same to intervening fence-posts.

p represents posts, to which the ends of the fence-wires are fastened before the weaving commences.

In case it is desired to use machine stationary, then a drum or reel upon which fence is wound, as made or woven, is used in lieu of the post *p*.

On either side of frame D, and extending the length of it, is a groove, in which base platform of machine is held and slides.

The whole combination is an upright machine for making or weaving fence composed of wire and pickets, and may be used, movably, along the line where a fence is to be made, or stationary. The twist of the wires may be either continuous or reversible.

To adjust and work the machine, the wire, in duplicate, is wound upon bobbins *b b b*. The ends of duplicate wires are then separately passed through cap on end of shafts *c c c*, and brought together again and fastened to post or reel *p*. A picket is then placed in aperture in top of frame at *q*, as shown in Fig. 2 by *h*, and dropped between the respective duplicate wires to position, as shown by *h* in Fig. 4. By throwing lever *e* forward the arms *g g g* press the picket to its proper place, and by turning crank *a* bobbins *b b b* and shafts *c c c* are revolved, and any desired number of twists are given to the wires; then, by pressing lever *i* forward and backward a sufficient number of times, cog-wheel *k*, working in cog-plate *l*, the frame A, B, and C is moved forward to such distance as may be desired between pickets, and is then ready for insertion of another picket, as before stated, and thus the process is continued.

655 & 656 If the fence is being constructed along the line where it is intended to stand, the posts are supposed to have been set at any intervals desired. When such length of fence has been woven that it is desired to fasten it to intervening posts, a proper tension of the wires is obtained by working lever *i*, and to retain this tension until the wires can be fastened to the posts by staples the board before mentioned, having three pins, is adjusted upon *n*. (See Fig. 5.)

The whole machine, while working, when used in the field, may be held in place by stakes driven into the ground, or by an anchor on back side of machine, attached to a fence-post. When fence has

been woven to length of frame, to move forward and readjust, draw stakes or detach anchor, raise small spring *x* on lever *i*, and then move frame by horse or other power.

Having thus fully described my invention, what I claim as new, and desire to secure by letters patent of the United States, is—

1. The combination, with the bed-plate provided with the toothed rack, of the frame provided with the revolving twisters carrying the bobbins, the sprocket-wheels, plain wheels, and endless chain, and the vertical shaft having arms, and the operating lever and spring, substantially as specified.

2. The combination, with the frame having the perforated board *n*, and the mechanism for twisting the wires and moving the frame, of the board *r*, provided with pins to fit the perforations in the board *n*, substantially as specified.

3. The combination, with the bed-frame provided with the toothed rack, of the movable frame carrying the twister mechanism, and provided with the shaft carrying the pinion *k*, ratchet-wheel *j*, lever *i*, and spring-pawl *m x*, substantially as specified

JOHN MANN FULTZ.

Witnesses:

JOHN R. RICE.
JOHN MEYER.

660 United States Patent Office.

JOSEPH S. WINSOR, of Providence, Rhode Island.

Machine for Making Weavers' Harness.

Specification forming part of Letters Patent No. 306,306, dated October 7, 1884. Application filed January 2, 1883. (No model.)

To all whom it may concern:

Be it known that I, Joseph S. Winsor, of the city and county of Providence, and State of Rhode Island, have invented certain new and useful improvements in machines for making weavers' harness, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

(Here follow diagrams marked pp. 657 & 659.)

My invention relates to that class of machines which are described and claimed in letters patent No. 12,175, granted to me January 2, 1855; and the invention relates more particularly to the switch-motion by which the movement of the twine-spools relative to the studs is controlled.

The object of my invention is to produce a simpler and more accurately-operating switch-motion than that described in my former patent, above referred to; and to this end my invention consists in the peculiar and novel construction and arrangement of parts, as hereinafter described.

In order that my invention may be fully understood, I will now proceed to describe it with reference to the accompanying drawings, in which—

Figure 1 is a plan view, partly broken away, of a portion of a machine for making weavers' harness, with my improvements applied. Fig. 2 is a longitudinal vertical section of the same. Fig. 3 is a transverse vertical section of the same, and showing also the cam for operating the switch-motion. Fig. 4 is a transverse vertical section of a portion of the machine-frame on an enlarged scale, showing one of the spool-carriers and one of the geared carriers by which the former is moved. Fig. 5 is an enlarged view in horizontal section of a spool-carrier engaged by a pair of the geared carriers, the two opposite positions of the switches being indicated in solid and in broken lines. Fig 6 is a plan view of the switch mechanism.

In machines for making weavers' harness, such as are described in my said former patent, four of the switches by which the direc-

(No Model.) 2 Sheets—Sheet 1.

J. S. WINSOR.

MACHINE FOR MAKING WEAVERS' HARNESS.

No. 306,306. Patented Oct. 7, 1884.

Fig. 1.

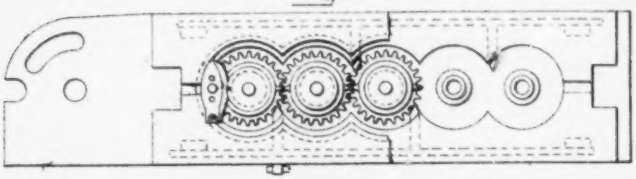


Fig. 2.

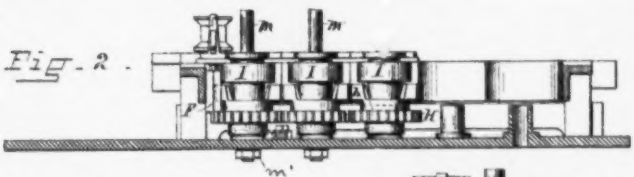


Fig. 3.

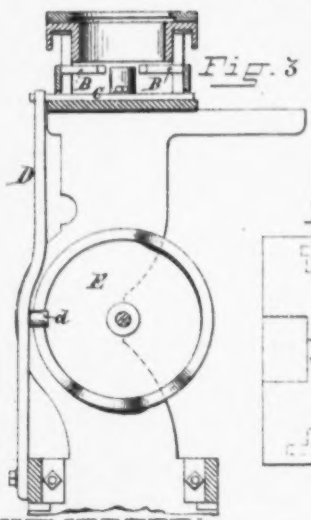


Fig. 4.

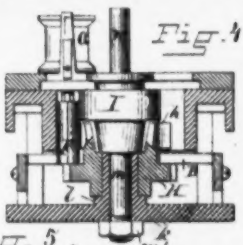
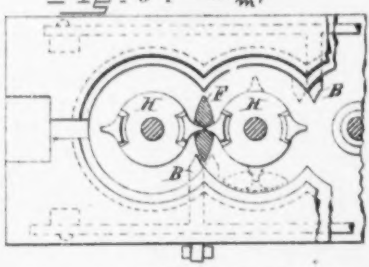


Fig. 5.



WITNESSES:

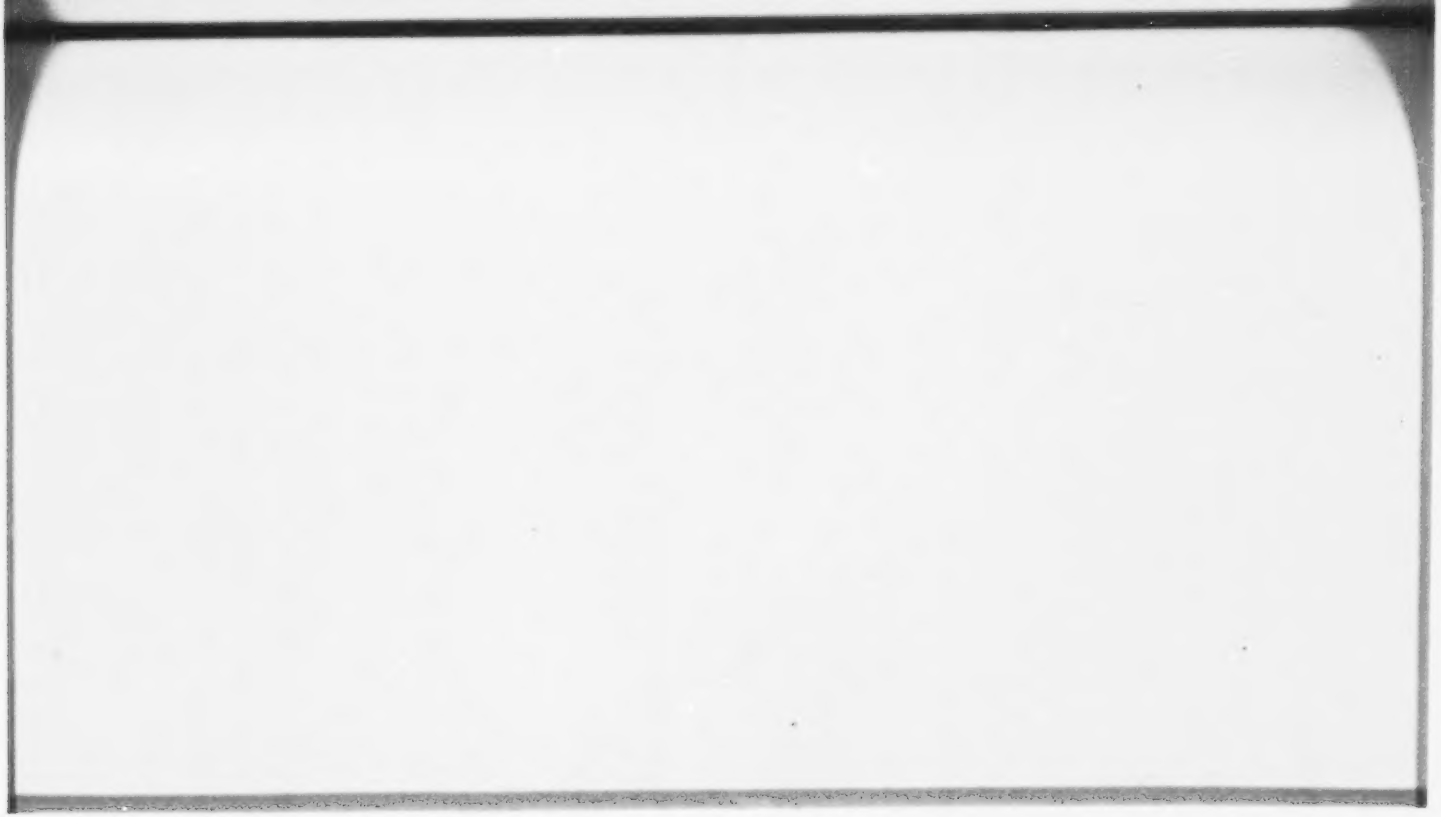
Wm. L. Cook.

C. H. Luttin Jr.

INVENTOR:

Joseph S. Winsor

by Joseph H. Miller & Co. Atty's



(No Model.) 2 Sheets—Sheet 2.

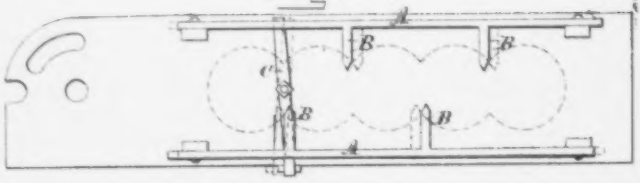
J. S. WINSOR.

MACHINE FOR MAKING WEAVERS' HARNESS.

No. 306,306. Patented Oct. 7, 1884.

No 1415 Kortright & Kelly } No 6659

Fig. 6.



WITNESSES:

Wm L. Cook

C. H. Lockwood Jr.

INVENTOR:

Joseph S. Winsor

by Joseph A. Keller & Co
Attys.

tion of movement of the spool-carriers or travelers is changed are each operated by a separate cam, and for this reason it is difficult to so adjust the switches as to insure and maintain them in such relation that they will direct the carriers invariably in their proper movements. In order to avoid this defect, I connect two switches on each side of the machine to a bar, and connect the two switch-bars to a centrally-pivoted lever, so that the two switch-bars and their four switches are operated simultaneously by connections with a single cam, whereby no repeated cam-adjustments are necessary, and whereby, also, the construction of the machine is simplified by dispensing with the cams shown in my said patent for operating three of the switches and three entire sets of operative connections therefor.

In the said drawings, A A designate the switch-bars; B B, the switches or switch-points; C, the centrally-pivoted connecting-lever, and D the cam-lever. The cam-lever D is connected at its upper end to either the lever C, as shown in Fig. 3, or with one of the switch-bars A, and at its lower end the said lever is pivotally attached to the machine-frame.

At the point indicated in Fig. 3 the lever D is provided with a pin or projection, *d*, which comes in contact with the cam E, which is mounted upon a cam-shaft journaled horizontally in the machine-frame, and connected by suitable gearing with the driving-shaft of the machine, as described in my said patent. By this arrangement the four switches are operated simultaneously and are caused to guide the spools in the manner described in my previously referred to patent.

The gears or geared carriers H, for operating the spool-carriers or travelers F, as heretofore constructed, have been supported on spindles which have been each provided with a circular portion forming a part of the way through which the spool-carriers move. These spool-carriers or travelers have to be frequently removed for cleaning and oiling, and the gears and spindles have to be readjusted after each such removal, which is a very objectionable consequence of the former arrangement.

In accordance with my invention I cast upon or otherwise secure to the plate *k* the sleeves *l*, so as to form a fixed center for each of the geared carriers H. The sleeve *l* is bored out to receive the spindle or stud *m*, and is trued so as to form a bearing for the gear H. Thus the spindle or stud *m*, with its center I, as also the gear H, can be readily removed. The plate *k* is secured in position upon the machine-frame directly under the plates F′, which form the external portions of the ways for the spool-carriers. The centers I are keyed to the studs *m*, and serve the purpose of forming the turning-points, together with the ways for the spool-carriers, as fully described in my former patent. The studs *m* are each secured in place in the plate *k* by a nut, *m*′, which is secured upon the lower end of the stud, and which, by being tightened up, causes the under side of the center I on the stud to bear upon the top of the sleeve *l* by reason of the action of the nut on the lower end of the stud.

661 & 662

Having thus described my invention, I claim as new and desire to secure by letters patent—

1. The combination, with the spool-carriers, the centers, the geared carriers, and the plates forming the external portions of the spool-carrier ways, of the switch-bars having the switch-points, the centrally-hinged connecting-lever, the hinged cam-lever provided with the pin, and the cam, all constructed and arranged to operate substantially as described.

2. The combination, with the spool-carriers, the studs, and the plates forming the external portions of the spool-carrier ways, of the plate *k*, the sleeves *l*, and the geared carriers H, substantially as and for the purposes set forth.

JOSEPH S. WINSOR.

Witnesses:

J. A. MILLER, JR.
HENRY J. MILLER.

(No Model.) 2 Sheets—Sheet 1.

J. MIDDAUGH & C. M. WILCOX.

PORTABLE FENCE MACHINE.

No. 309,724. Patented Dec. 23, 1884.

Fig. 1.

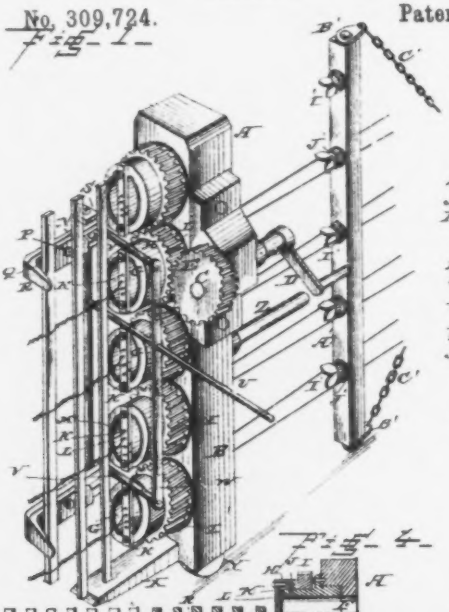


Fig. 3.

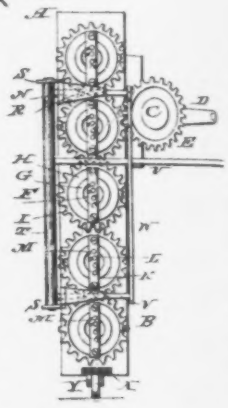
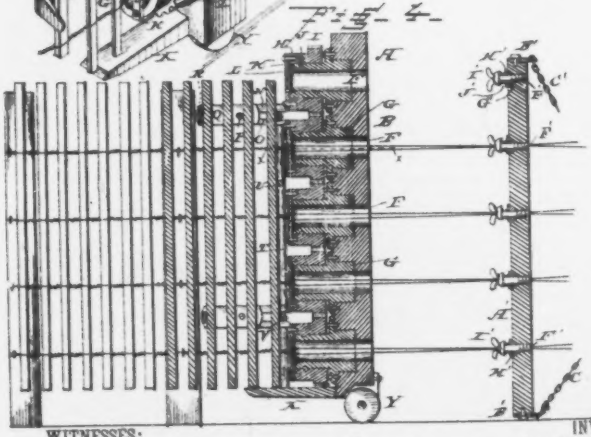


Fig. 4.



WITNESSES:

Edd. G. Dieterich.

Wm. Bagger.

INVENTORS.

Jacob Middaugh and Charles M. Wilcox,

by Louis Bagger & Co.,

ATTORNEYS.

1159

(No Model.) 2 Sheets—Sheet 2.

J. MIDDAUGH & C. M. WILCOX.

PORTABLE FENCE MACHINE.

No. 309,724. Patented Dec. 23, 1884.

Fig. 5.

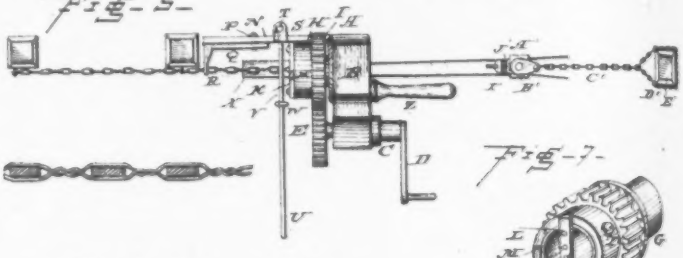


Fig. 7.

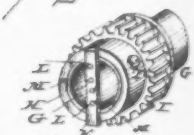


Fig. 6.

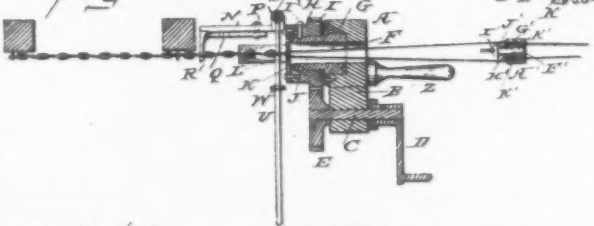
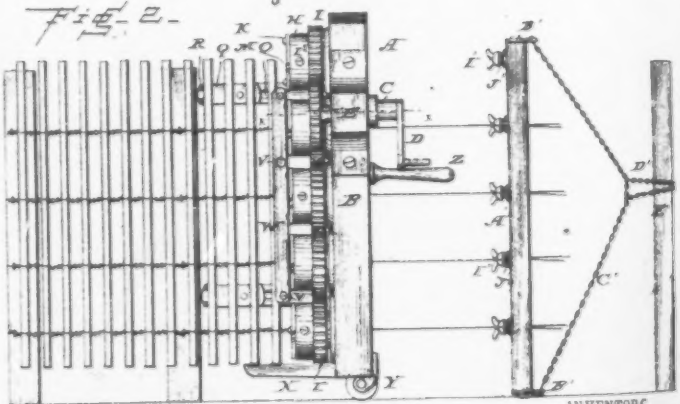


Fig. 2.



WITNESSES:

Fred. G. Dietzsch.
Wm. Bagger

INVENTORS.

Jacob Middaugh & Chas. M. Wilcox,
by Louis Bagger & Co.
ATTORNEYS.

No. 148. Notarial Fabulum—B. 665

666

United States Patent Office.

JACOB MIDDAUGH and CHARLES M. WILCOX, of New Paris, Ohio.

Portable Fence Machine.

Specification forming part of Letters Patent No. 309,724, dated December 23, 1884. Application filed August 11, 1884. (No model.)

To all whom it may concern:

Be it known that we, Jacob Middaugh and Charles M. Wilcox, both of New Paris, in the county of Preble and State of Ohio, have invented certain new and useful improvements in portable fencing-machines; and we do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification, and in which—

(Here follow diagrams marked pp. 663 & 665.)

Figure 1 is a perspective view of our improved machine for building fences. Fig. 2 is a side view showing the same in position for operation. Fig. 3 is a front view of the machine. Fig. 4 is a vertical sectional view of the same and of the tension-bar in position for operation. Fig. 5 is a plan view of the machine in position for operation. Fig. 6 is a horizontal sectional view taken on the lines *x x* in Figs. 2 and 4, and Fig. 7 is a perspective detail view of one of the twisting wheels or disks.

The same letters refer to the same parts in all the figures.

This invention relates to machines for building or constructing that class of fences which are known as "wire-and-picket" fences, and which consist of pickets or palings connected by twisted or woven wire; and our invention has for its object to provide a machine of this character which shall possess superior advantages in point of simplicity, durability, and general efficiency, and which may be easily manipulated by any farm-hand for the purpose of constructing a fence in the desired position.

The invention comprises, essentially, a twisting device having an adjustable gage and a palings-tightener, and a tension device through which the wires are fed to the twister.

The invention further consists in the improved construction and arrangement of details, which will be hereinafter fully described, and particularly pointed out in the claims.

In the drawings hereto annexed, A designates the twisting device, which comprises a frame-bar, B, one side of which is provided with a bearing for a transverse shaft, C, having an operating crank or handle, D, at its rear end, and provided at its front end with a spur-wheel, E. The frame-bar B is provided with a series of transverse openings, F F, provided with bell-shaped tubular spindles G G, upon which are mounted a series of wheels or disks, H H, the inner or rear ends of which are provided with teeth or gears I, meshing together, as shown. One of the said gear wheels or disks meshes with the spur-wheel E, so that by revolving the latter a rotary motion may be imparted to the entire series of disks H. The latter are retained in position upon their respective spindles by means of set-screws I^2, working in circumferential grooves J in the said spindles. Each of the disks H is provided upon its front side with a transverse bar or cross-piece, K, having a series of openings, L L, from which diagonal slits M extend to the edges of the said cross-piece or bar. The wires are in practice to be threaded through two of the said openings which are equidistant from the center of the bar, and when desired—for instance, for the purpose of weaving in palings of a different size—the said wires may be removed from the openings in which they have been first placed, through the slits M, and adjusted in other openings without necessity for cutting the wires. It will also be noticed that the openings L are of sufficient size to admit of the passage of splices in the wires whenever they may occur. One side of the frame-bar B is provided near its upper and lower ends with forwardly-extending arms or brackets N N, which are provided with horizontal slots O, to receive the set-screws P, by means of which the adjustable gage-plates Q are secured to the said arms or brackets. The said gage-plates consist simply of plates, the forward ends of which are provided with laterally-extending fingers R, the function of which will be presently made clear.

The arms or brackets N N are provided near their inner ends with lateral outwardly-extending lugs S S, forming bearings for the upper and lower ends of a vertical rock-shaft, T, having a handle, U, and arms V V, connected by a frame-bar, W.

The arms V and the handle U constitute the tightening device, the operation of which will be presently explained.

The frame-bar B is provided near its lower end with a
667 step, X, adapted to support the last paling inserted while it is being woven into the panel, thus causing all the palings to be set evenly as to height. The lower end of frame-bar B is provided with a wheel or caster, Y, upon which it may be readily moved during the process of constructing the fence, and which will also serve as a pivot upon which the frame-bar may turn in a horizontal plane, and the rear side of the frame-bar is provided with a handle, Z, by means of which it may be conveniently manipulated.

A′ designates the tension-bar, which consists of a rod or bar of wood, metal or other suitable material of about the same length as the frame-bar B, and provided at its upper and lower ends with swivelled plates B′ B′, to which are attached the ends of a chain or rope, C′, which may during operation be suitably attached, by

means of an additional rope or chain, D′, to a stake, post, or other fixed point, E′, which, as it should be in the line of the fence, may be one of the fence-posts. The tension-bar is provided with a series of screw-threaded perforations, F′ F′, registering with the openings F in the frame-bar B. The ends of the perforations F′ facing the said frame-bar are countersunk, as at G′, to receive the conical washers H′, which are retained in position by means of set-screws I′, between the heads of which and the said washers coiled springs J′ are interposed, for the purpose of supplying a yielding pressure, the tension of which may be regulated by tightening or loosening the said set-screws.

Adjoining each of the openings F′ in the bar A′ are formed two small orifices, K′, for the purpose of admitting the fence-wires. These orifices terminate in the countersinks G′, so that the wires shall pass under the conical washers H′, which latter may be adjusted in the manner described, so as to supply any desired degree of tension.

The operation of the invention is as follows: The wires are first threaded through the perforations in the tension-bar under the conical washers, which latter are at first so adjusted as to permit the wires to pass through freely. The ends of the wires are next passed through the perforations F and spindles G of the frame-bar B, and through the proper perforations of the cross-bars K of the twisting-disks H, after which they are suitably attached to the end post of the fence. The tension-bar is now suitably anchored to one of the fence-posts, or to some other fixed point, a sufficient quantity of wire being unwound from the spools. One of the pickets or palings is now adjusted between the wires and several turns given to the shaft C, carrying the spur-wheel E, whereby the several twisting-wheels are rotated and the wires twisted so as to bind the paling securely in position. It will be noticed that the paling while being operated upon is supported upon the step X of the frame-bar, and that each paling operated upon is likewise supported so that all will be set at an even height. The machine is now moved slightly back and another paling placed in position and tightened up against the first twist by means of the tightening-frame T U V W, which is simply swung or moved laterally by means of its handle, so as to force the paling up against the twist. The shaft C, carrying the spur-wheel E, is now turned several times in a direction opposite to that in which it was last turned, thus twisting the wires so as to secure the paling, and at the same time untwisting the wires back of the machine. This operation is repeated until the first panel has been formed. The tension is then tightened and a few palings placed or woven in position so as to take up any slack from the first panel. The wires are then stapled to post No. 2, and the tension may afterward be readily adjusted so that the feed of wire shall be properly regulated. After a few palings or pickets have been placed in position the gage-plates Q are adjusted so that the fingers R shall rest against one of the said palings during operation. When the paling last operated upon has been secured, the machine is, by taking hold of the handle, swung horizontally so as to release

the fingers R, after which the machine is moved back until the said fingers shall engage the next paling, when the operation is repeated.

It is obvious that the gage-plates may be adjusted so as to leave any desired space between the palings.

This machine, as will be seen, is exceedingly simple in construction, and it is therefore not liable to get out of order. It may be constructed at a moderate expense, and with it a durable and attractive fence may be constructed rapidly, easily, and at a small expense.

Having thus described our invention, we claim and desire to secure by letters patent of the United States—

1. A portable machine for constructing wire-and-picket fences, comprising a frame-bar mounted upon a single wheel or caster, and having a series of twisting-wheels geared together and adapted to be operated by means of a spur-wheel meshing with one of the said twisting-wheels, substantially as and for the purpose set forth.

2. In a portable machine for constructing wire-and-picket fences, the combination, with a frame-bar having a series of tubular bell-shaped spindles, of a series of twisting-wheels geared together and mounted upon the said spindles, substantially as and for the purpose set forth.

3. In a portable fencing-machine, the combination, with a frame-bar having tubular spindles, of the twisting-wheels mounted upon the same, and provided at their front ends with cross-bars having perforations or orifices from which diagonal slits extend to the edges of the said bars, substantially as and for the purpose set forth.

4. In a portable fencing-machine, the combination of a frame-bar, a series of twisting-wheels mounted on the same upon
668–670 tubular spindles and geared together, and a step arranged near the lower end of the said frame-bar for the purpose of supporting the palings or pickets while being operated upon, substantially as set forth.

5. In a portable fencing-machine, the combination of a frame-bar having a series of twisting-wheels mounted upon tubular spindles, and provided with forwardly-extending horizontally-slotted arms, with gage-plates secured adjustably to the said arms and provided with laterally-extending fingers, substantially as and for the purpose set forth.

6. In a portable fencing-machine, the combination of a frame-bar having a series of twisting-wheels mounted upon tubular spindles, and provided with forwardly-extending arms having laterally-extending lugs, with a rock-shaft mounted in the said lugs and having a suitable handle, and a pair of arms connected by a frame-bar, substantially as and for the purpose set forth.

7. In a portable fencing-machine, the herein-described frame-bar having a series of perforations and tubular spindles, the twisting-wheels mounted upon the same and geared together, a spur-wheel mounted upon a crank-shaft and meshing with one of the twisting-wheels, a step at the lower end of the said frame-bar, arms extending forwardly from the said frame-bar, and having adjustable gage-plates and lugs supporting a pivoted tightening-frame, and a wheel

or caster at the lower end of the said frame-bar, all arranged and operating substantially in the manner and for the purpose herein shown and specified.

8. In a portable fencing-machine, the combination, with the twisting apparatus, constructed substantially as described, of a tension-bar, provided at its upper and lower ends with swiveled plates connected by a rope or chain, whereby the said tension-bar may be connected securely to a fixed point during operation, substantially as and for the purpose set forth.

9. In a portable fencing-machine, the herein-described tension-bar, having a series of screw-threaded perforations countersunk at their outer ends, smaller orifices adjoining the said perforations and terminating in the countersinks of the latter, conical washers fitting in the said countersinks, set-screws working in the screw-threaded perforations, and coiled springs interposed between the washers and the heads of the set-screws, substantially as and for the purpose set forth.

10. A portable fencing-machine comprising a twisting device having a series of twisting-wheels mounted upon tubular spindles, and constructed and meshed together as described, a supporting-step, an adjustable gage, and a pivoted tightening-frame, and a tension-bar having countersunk perforations, conical washers, orifices for the passage of the fence-wires, tightening-screws, and springs bearing against the washers, all constructed, combined, and operating substantially in the manner and for the purposes herein shown and specified.

In testimony that we claim the foregoing as our own we have hereunto affixed our signatures in presence of two witnesses.

JACOB MIDDAUGH.
CHARLES M. WILCOX.

Witnesses:

F. S. RICHEY.
L. W. RICHEY.

682 United States Patent Office.

HIRAM S. COMBS, of Detroit, Michigan.

Wire-netting Machine.

Specification forming part of Letters Patent No. 310,254, dated January 6, 1885. Application filed October 23, 1883. (No model.)

To all whom it may concern:

Be it known that I, Hiram S. Combs, of Detroit, county of Wayne, State of Michigan, have invented a new and useful improvement in wire-netting machines; and I declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form a part of this specification.

My invention consists of the combination of devices and appliances hereinafter specified, and more particularly pointed out in the claims.

(Here follow diagrams marked pp. 671, 673, 675, 677, 679, & 681.)

In the drawings, figure 1 is a front elevation of a device embodying my invention. Fig. 2 is a plan view. Fig. 3 is an end elevation. Fig. 4 is an elevation of the opposite end. Fig. 5 is a vertical section through the line *x* and *y*. Fig. 6 is a separate view of the bobbin and gears. Fig. 7 is a section of the same. Fig. 8 is a horizontal section through the rack-bars. Fig. 9 is a similar section showing the gears partially rotated. Fig. 10 is a similar section showing the gears carried half-way over. Fig. 11 is a detail view of the selvage mechanism in the rear elevation. Fig. 12ª is a separate side elevation of the same. Fig. 12ᵇ is a separate view of the bearing. Fig. 12ᶜ is a separate view of the fork. Fig. 13 is a vertical section of Fig. 1, looking toward the selvage mechanism, and taken just at the left of the wheel S. Fig. 14 is a perspective view showing the device for operating located at the left side of Fig. 1.

The object of my invention is to provide a machine for the manufacture of wire fencing. Heretofore great difficulty has been experienced, in the use of machines of this class, in netting a heavy grade of wire, such as is desirable for a durable and strong wire fencing.

It is the purpose of my invention to provide an improved machine adapted to weave heavy as well as light grades of wire, and also to combine with the woven fencing a strong selvage of two or more wires suitably twisted together and combined with the meshes of the fencing in the process of its manufacture.

(No Model.) 6 Sheets—Sheet 1.

H. S. COMBS.

WIRE NETTING MACHINE.

No. 310,254. Patented Jan. 6, 1885.

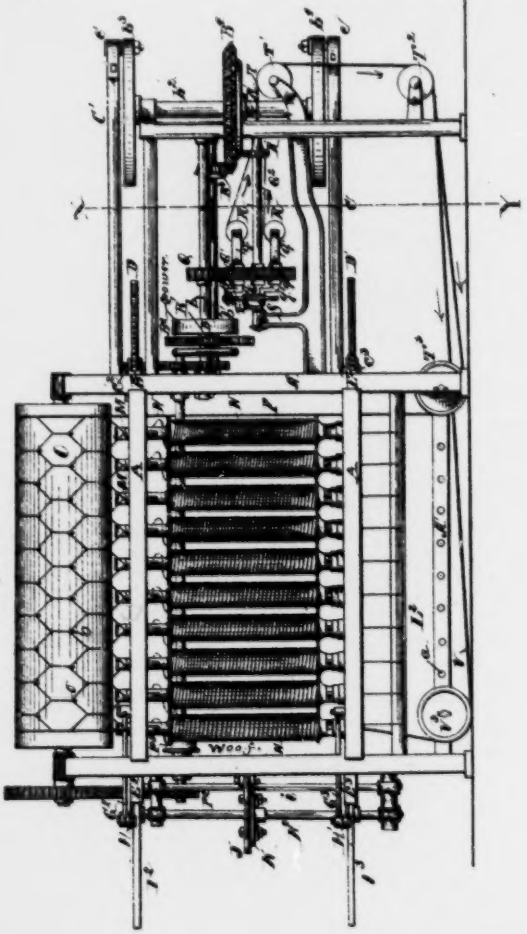


Fig. 1.

WITNESSES

Samuel E. Thomas.

N. S. Wright.

Hiram S. Combs. INVENTOR

By C. W. & L. Legg Atty's.

Attorneys

(No Model.) 6 Sheets—Sheet 2

H. S. COMBS.

WIRE NETTING MACHINE.

No. 310,254. Patented Jan. 6, 1885.

No. 1448 Morton C. Kittelman

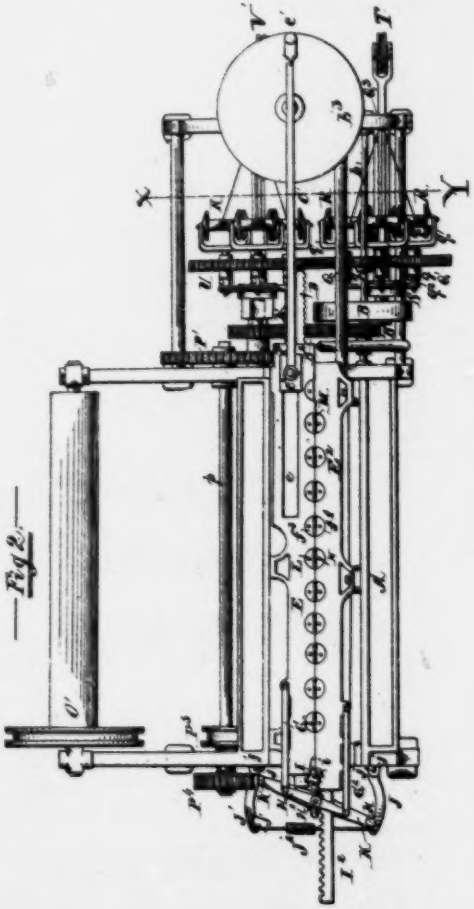


Fig 2.

WITNESSES

Samuel C. Thomas.

N. S. Wright.

INVENTOR

Hiram S. Combs.

By Wood Foggett

Attorney

(No Model.) 6 Sheets—Sheet 3.

H. S. COMBS.

WIRE NETTING MACHINE.

No. 310,254. Patented Jan. 6, 1885.

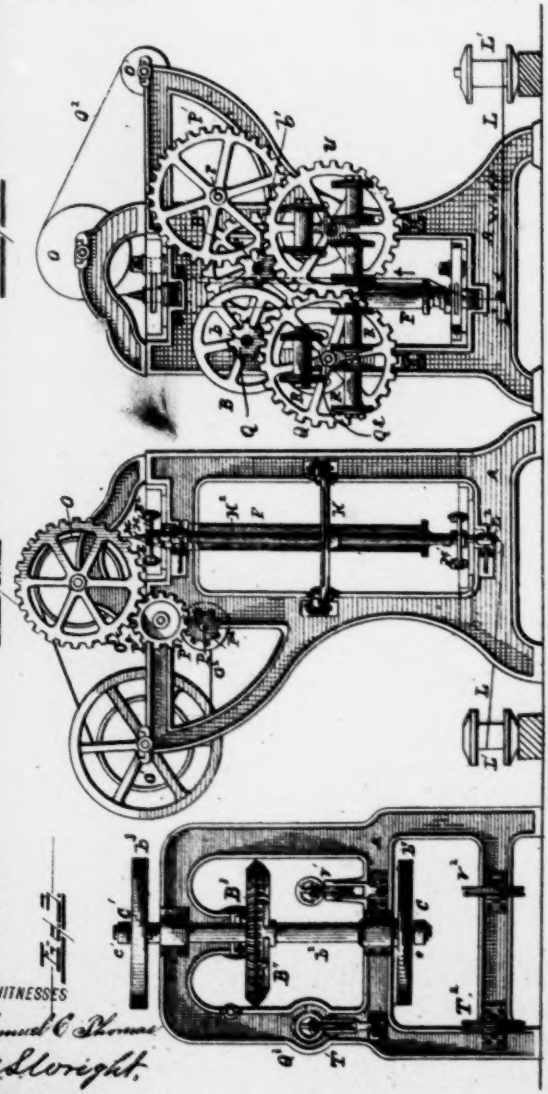


Fig. 5.

Fig. 4.

Fig. 7.

Fig. 6.

Fig. 3.

WITNESSES

Samuel C. Thomas

W. S. Wright.

INVENTOR

Hiram S. Combs

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(No Model.) 6 Sheets—Sheet 4

H. S. COMBS.

WIRE NETTING MACHINE.

No. 310,254. Patented Jan. 6, 1885.

Fig. 8.

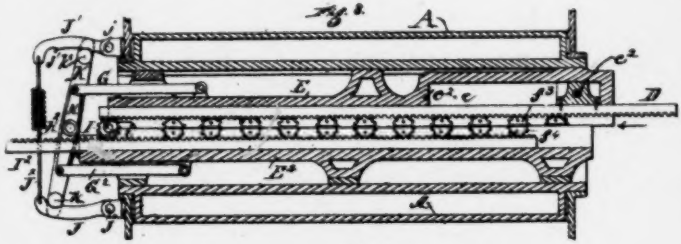


Fig. 9.

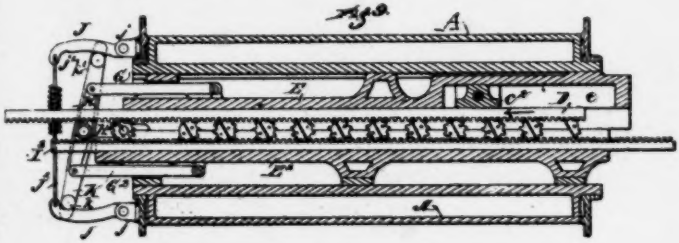
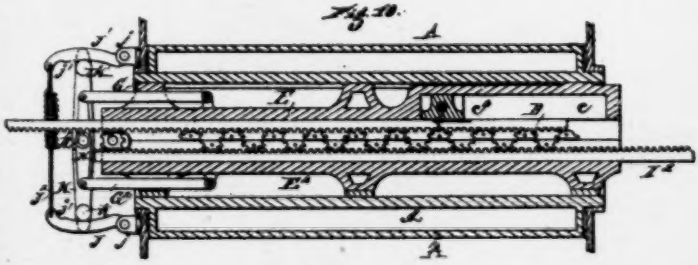


Fig. 10.



WITNESSES

N. B. O'Hagherty.
N. D. Wright.

INVENTOR

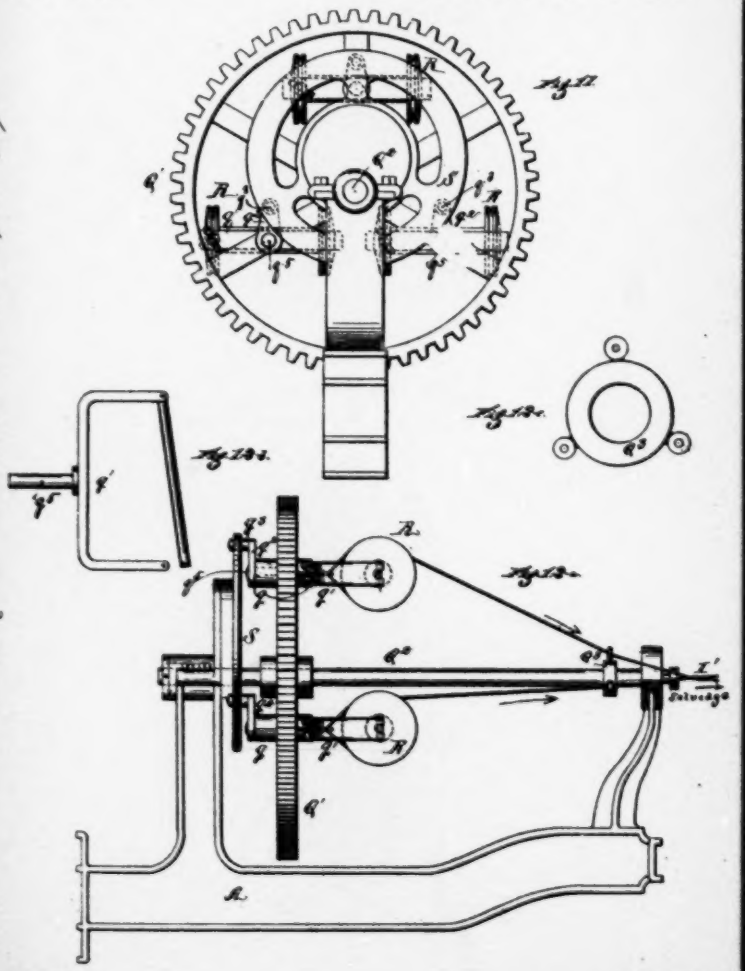
Hiram S. Combs
By Cowles & Cowles
Attys.

(No Model.) 6 Sheets—Sheet 5.

H. S. COMBS.

WIRE NETTING MACHINE.

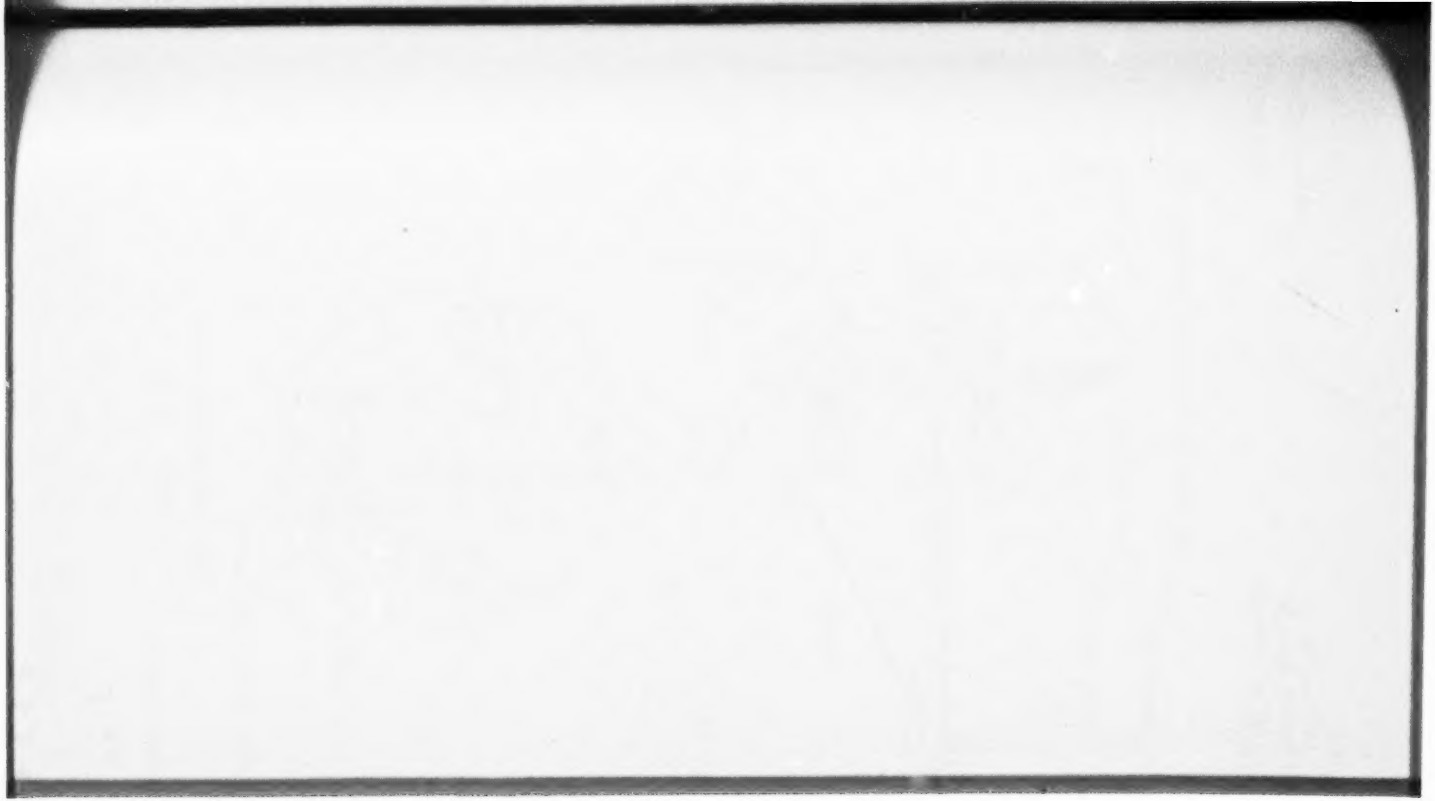
No. 310,254. Patented Jan. 6, 1885.



WITNESSES

INVENTOR

Attorney



(No Model.) 6 Sheets—Sheet 6.

H. S. COMBS.

WIRE NETTING MACHINE.

No. 310,254. Patented Jan. 6, 1885.

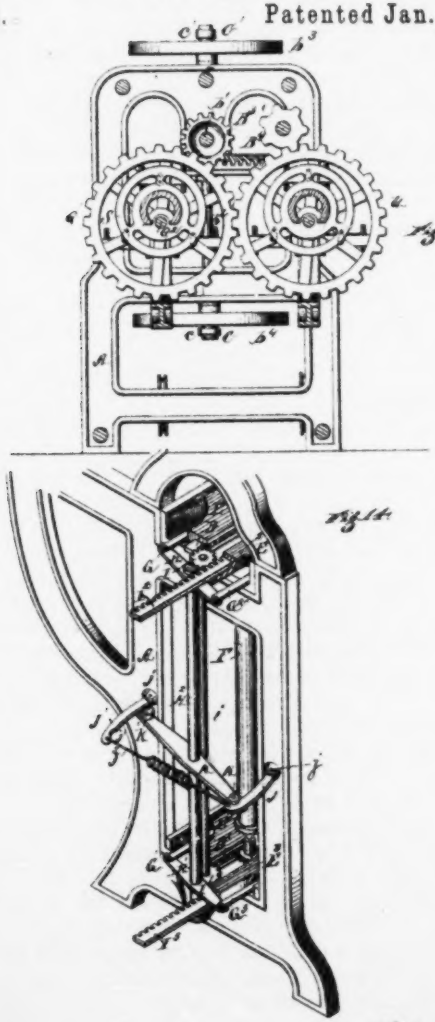


Fig. 13.

Fig. 14.

No. 1148. Kokomo Co. v. Kinsman 4 681

WITNESSES

N. B. O'Hagherty

N. S. Wright

INVENTOR.

Hiram S. Combs.

By W. W. Foggett

Attorney

It is also the purpose of my invention to provide a machine adapted to manufacture such a fencing which shall have more even and regular meshes than any fencing of this kind heretofore made, and which shall also be stronger and more symmetrical.

Hitherto much difficulty has been experienced in wire fencing of various sorts wherein the fencing or the selvage has consisted of a single wire, owing to the expansion and contraction caused by the action of heat.

It is the object of my invention, furthermore, to guard against this difficulty, which I accomplish by constructing the selvage of two or more, preferably three, wires twisted together, whereby the elasticity of two or more wires thus twisted tends to compensate for the contraction and expansion of a single wire.

It is my object, also, to provide an improved machine for the manufacture of all kinds of wire-netting, as I do not limit myself to the manufacture of fencing.

I carry out these objects as follows:

As illustrated in the drawings, A represents any suitable supporting-frame.

B is a driving-pulley mounted on a shaft b.

B′ is a driving-pinion mounted upon the shaft b, adapted to mesh with the driving-gear B^2, said gear mounted upon the shaft b'. The shaft b' is provided with a beveled pinion, B^3, meshing with the beveled gear B^4, mounted upon the shaft b^2, said shaft provided with balance-wheels b^3 and b^4.

C is the lower pitman, and C′ is the upper pitman. Each pitman is suitably connected with one of the balance-wheels—as, for instance, by wrist c or c' preferably made adjustable, so as to give any desired throw to the pitman. The upper and lower pitmen are also connected with head-blocks c^2 and c^3. The head-blocks c^2 and c^3 are suitably connected with rack-bars D and D′, and are adapted to slide in the slots e of the slides E and E′, said head-blocks forming a contact with said slides at the extremities of the slots.

F represents a series of bobbins, of any desired number. Said bobbins are adapted to revolve upon the spindles f. These bobbins are provided at their lower ends with a divided gear, f' and f^3, and at their upper ends with a divided gear f^2 and f^4. (See Figs. 6 and 7.)

These bobbins are secured to the divided gears at the bottom
683 by means of a collar, f^5, and at the top they are hinged to the half-gear f^4, as shown at f^6. The rack-bars D and D′ are adapted to mesh with these divided gears at the top and bottom of the spindles. Said rack-bars are also suitably connected with the head-blocks c^2 and c^3, so that when said head-blocks are projected through the slots e the rack-bars will give to the bobbins one or more revolutions, as may be desired, before said head-blocks come in contact with the slides E and E′. Upon said head-blocks coming in contact with said slides, the slides are projected one-half the distance between the centers of two adjoining bobbins. Said slides are connected by suitable links, G and G′, with the eveners H and H′, said eveners mounted upon a shaft, H^2.

E^2 and E^3 represent additional slides, which, with the slides E

and E′, form the bearing of the divided gears of the bobbins. The slides E^2 and E^3 are also provided with links G^2 and G^3, connected upon the eveners H and H′. By this construction it is evident that when the slides E and E′ are forced in one direction the slides E^2 and E^3 will be forced in the opposite direction an equal distance, and thereby the divided gears will also be projected in the opposite direction, so that the half-gear of one bobbin will coincide with the half-gear of the adjacent bobbin throughout the series.

I represents suitable gears mounted upon the upper and lower ends of the shaft *i*, and adapted to mesh with the rack-bars D and D′, and to mesh with additional rack-bars I^2, and I^3. These rack-bars I^2 and I^3 are adapted to mesh with the divided gears upon the bobbins and to move forward the half-gears adjacent thereto upon the movement of the slides E and E′. These rack-bars may be located in any suitable manner—as, for instance, they may be inserted in suitable grooves in the slides.

J and J′ represent locking-arms suitably pivoted or hinged upon the frame as shown at *j*, and are connected at their opposite ends by means of a suitable spring, J^2. These arms are provided with locking-grooves *j′*, adapted to receive the rollers *k* and *k′*, located upon the ends of the evener K, said evener keyed upon the shaft H^2. It will be seen that when the roller *k* is engaged in the locking-groove of the arm J the slides are located in such a position that the adjacent half-gears may be suitably rotated, and when the slides are reciprocated in the opposite direction the roller *k′* will be engaged in the locking-groove of the arm J′, and the slides will again be locked with the adjacent half-gears until the bobbins are again rotated as desired. The method of operating the bobbins is now evident. The wire warp L, leading from the spools L′, runs under a suitable roller, L^2, thence upward through the half-gears *f′* outside of the bobbin, and through the half-gears f^3 at the top of the bobbin.

M represents a series of arms, secured preferably to the half-gears f^4. They may, however, if preferred, be secured to the half-gear *f′*, or said arms may be made in two parts, one of said parts secured to each of said half-gears. I would have it understood that I do not limit myself to any particular method of securing said arms to said gears. Said arms are designed to project upward, as shown, so that the wires to be twisted will be carried upward and be twisted over their upper edges, as by this means a much more perfect twist can be made than would be the case if the wires were twisted nearer to the ends of the gears.

N represents the wire woof coiled about the bobbins, and passing forward through the half-gears f^4 to the top of the arms M, meeting the wires L at that point, at which point it is evident the wires will be twisted upon the rotation of the bobbins. The meshes of the wire fencing are caused by the reciprocation of the slides carrying the divided gears.

O is a roller over which the fencing is carried after being twisted over the edges of the arms M, said roller provided with suitable spurs, o, to carry the fencing forward away from the machine, after

which it may be wound upon any suitable reel, O′, said reel driven by a friction belt, O^2.

P is a pinion mounted upon the shaft b', meshing with the gear P' upon the shaft p, said shaft also provided at its opposite end with a gear, P^4, and flanged pulley P^3 for driving a reel. P^4 is an intermediate gear meshing into a suitable gear, O^3, upon the roller O to drive said roller.

I will now proceed to describe the mechanism for the manufacture of the selvage. Upon the driving-shaft b is a pinion, Q, meshing with a gear, Q′, upon the shaft Q^2. The gear Q′ is provided with a suitable number of hubs, q, preferably three in number.

q' represents a series of rotary forks having their bearings in the hubs q of the gear Q′, said forks provided with a spindle carrying the spools R, which may be removably secured upon said spindles, said spools carrying the wire of which the selvages are composed. The shafts q^5 of said forks are suspended so as to pass through the hubs q, and are provided upon their ends opposite the spools with cranks q^2. Said cranks are secured upon the wheel S by means of connecting-wrists q^3. The said wheel S has its bearings at a suitable distance from the shaft Q^2, said distance corresponding with the length of the crank q^2. It will be seen that by this construction as the gear Q′, with the forks carried in its hubs, revolves the connection of the cranks q^2 to the wheel S will cause the spools to be always kept the same side uppermost in the process of said revolution. The wires from said spools are led through a suitable bearing or collar, Q^3, more particularly shown in Fig. 12^a, and through the bearing of the shaft Q^2, and are twisted by the revolution of the gear Q′, as shown at R′. The selvage T passes over the rollers T′ and T^2 and under the roller T^3, through the half-gears f at the base of one of the outside bobbins, thence forward outside the bobbin and through the half-gear f^2, upon the opposite extremity of said bobbin, and over the upper edge of the arm M adjacent thereto, at which peint it is twisted together with the warp coming from the bobbin, the selvage taking the place of the woof upon one of the outside bobbins.

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U is an additional gear, the duplicate of the gear Q′, and provided with duplicate mechanism, already described, for carrying and twisting the wire of which the opposite selvage is composed, the said selvage V passing over the rollers V′ and V^2, thence under to roller V^3, and upward through the half-gear of the opposite bobbin in the manner already described, at the top of which it is twisted with the wire upon said bobbin to form the opposite selvage.

In the manufacture of fencing from light wire, as heretofore practiced, a single set of rack-bars, D and D′, have been employed; but when it has been attempted to manufacture fencing of heavy wire with a single set of rack-bars and half-gears upon the bobbins, they refuse properly to turn, and are liable to become locked and to spread the slides apart, thus breaking the machine and stopping the work. By the employment of the additional rack-bars I^2 and I^3, driven by the pinions upon the shaft i, this difficulty is overcome. This mechanism is thus adapted to manufacture wire fencing, or

wire-netting of any description, of much heavier wire than has heretofore been employed, while at the same time it will operate readily and smoothly.

The rollers T^3 and V^3 may be adjusted upon the bar A′, said bar being constructed with a series of bearings, *a*, for this purpose. By adjusting said rollers nearer together or farther apart, as the case may be, leaving off or adding the required number of bobbins, the fencing may be made of any desired width upon the same machine. The selvages T and V, I prefer to twist in opposite directions, and to unite them also in opposite directions upon the warp and woof.

What I claim is—

1. In a wire-netting machine, the combination, with one or more bobbins, each provided with a gear upon each end, of the arm M, substantially as described.

2. The combination, in a wire-netting machine, of two sets of slides, E E′, E^2 E^3, and two sets of rack-bars, D and D′, I and I′, adapted to mesh with divided gears upon the bobbins, substantially as and for the purpose described.

3. The combination, with a series of bobbins having divided gears, of two sets of slides provided with two sets of rack-bars adapted to mesh with said gears, said slides connected by eveners, substantially as described.

4. The combination, with a series of bobbins having divided gears, of two sets of slides provided with two sets of rack-bars adapted to mesh with said gears, said slides connected by eveners, and in connection therewith mechanism for suitably holding said slides as the rack-bars are reciprocated, substantially as described.

5. The combination, with two sets of slides, E E′, E^2 E^3, connected by eveners mounted upon a shaft, H^3, of an additional evener, K, mounted upon said shaft, and in connection therewith suitable locking-arms, J J′, substantially as described.

6. The combination, with a series of bobbins having divided gears, of two sets of slides, two sets of rack-bars adapted to mesh with said gears, said slides connected by eveners mounted upon a shaft, an additional evener, K, mounted upon said shaft, and in connection therewith suitable locking-arms, substantially as and for the purpose described.

7. The combination, with a series of bobbins having divided gears upon each end, of two sets of slides, E E′, E^2 E^3, said slides each provided with a rack-bar adapted to mesh with said gears upon opposite sides, and means for suitably holding said slides in a given position while the wire is twisted, substantially as described.

8. In a wire-netting machine provided with a series of bobbins having divided gears on each end, the slides E and E^3, located at one end of said bobbins, the slides E′ E^3 at the opposite ends, said slides connected by eveners H and H′, mounted upon the shaft H, and one of the slides at the top and bottom of the bobbins provided with a slot, *e*, the head-blocks adapted to slide in said slots, and the rack-bars connected with said blocks, substantially as described.

9. The combination, with a series of bobbins having divided gears, of two sets of slides forming the bearings of the divided gears, two

sets of rack-bars adapted to mesh with said gears, and in connection therewith the gears I and I′, suitably mounted upon a shaft, and adapted to mesh with said rack-bars, substantially as described.

10. The combination, with two sets of slides, E E′ and E^2 E^3, of the eveners H and H′, mounted upon a shaft, said shaft provided with an evener, K, mechanism for holding said slides from being reciprocated while the wire is twisted, and in connection therewith gears I and I′, and rack-bars with which said gears mesh, substantially as described.

11. In a wire-netting machine provided with a series of bobbins having divided gears, the slides E and E^2, located at the upper end of said bobbins, the slides E′ and E^3, located at the lower end of said bobbins, said slides forming the bearings of the bobbins and connected by eveners, and each provided with a rack-bar, one of said slides at the top and bottom provided with a slot, *e*, and in connection therewith the rods C and C′, provided with suitable cross-heads adapted to travel in said slots, said cross-heads secured 685 & 686 to the rack-bars D and D′, the construction being such that said rack-bars may be caused to travel the length of the slot and the slides to be then reciprocated, substantially as described.

12. In a wire-netting machine, the gear Q′, mounted upon a suitable shaft, said shaft provided with two or more hubs, and the forks F′, carrying spools R, having bearings in said hubs, said bearings provided with cranks q^2, suitably secured upon a wheel, S, said wheel having its bearing at a distance from the shaft of crank q^2 corresponding to the length of said crank, all constructed and arranged substantially as and for the purpose described.

13. In a wire-netting machine consisting of the combination, with a frame and suitable driving gear, of a series of bobbins provided with half-gears at the ends of the bobbins, two sets of slides forming the bearings of said gears, said slides provided with two sets of rack-bars, mechanism for reciprocating said rack-bars and slides, mechanism for holding the slides while the rack-bars are partially reciprocated, and in connection therewith suitable mechanism for twisting two or more strands, the construction being such that as the slides are reciprocated the half-gears will be interchanged and the warp and the woof of the selvage be suitably netted together by the rotation of the bobbins, substantially as described.

14. The combination, with a suitable frame, of a series of bobbins provided with half-gears at the ends of the bobbins, two sets of slides forming the bearings of said bobbins, said slides provided with rack-bars adapted to mesh with said divided gears at the top and bottom of the spindles, and in connection therewith suitable mechanism for reciprocating said slides and rack-bars, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

HIRAM S. COMBS.

Witnesses:
N. S. WRIGHT.
M. B. O'DOGHERTY.

694 United States Patent Office.

SAM WATSON, of Straughn, Indiana.

Wire-fence Machine.

Specification forming part of Letters Patent No. 322,872, dated July 21, 1885. Application filed April 29, 1885. (No model.)

To all whom it may concern:

Be it known that I, Sam Watson, a citizen of the United States, residing at Straughn, in the county of Henry and State of Indiana, have invented certain new and useful improvements in wire-fence machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which — appertains to make and use the same.

My invention relates to that class of fence-machines in which the pickets and wires are bound together and the fence put up in one operation.

The invention consists of constructions and combinations, all as will hereinafter be described, and pointed out in the claims, reference being had to the accompanying drawings, in which—

(Here follow diagrams marked pp. 687, 689, 691, and 693.)

Figure 1 represents a side elevation of the machine when at work; Figs. 2, a vertical section of the twisting-frame; Fig. 3, an end elevation of the spool or reel frame; Fig. 4, a side elevation of the spool or reel frame; Fig. 5, a plan view showing the brake mechanism. Fig. 6, a section on line *y y*, Fig. 5, the part A^4 being shifted so that the standards *a* would be on the line *y y*, Fig. 1; Fig. 7, a front elevation of a twisting-head, showing elongated slots; Fig. 8, a section of the device shown in Fig. 7, the line of section being through the slots; Fig. 9, a horizontal section through the posts E, showing the manner in which the wires pass around them.

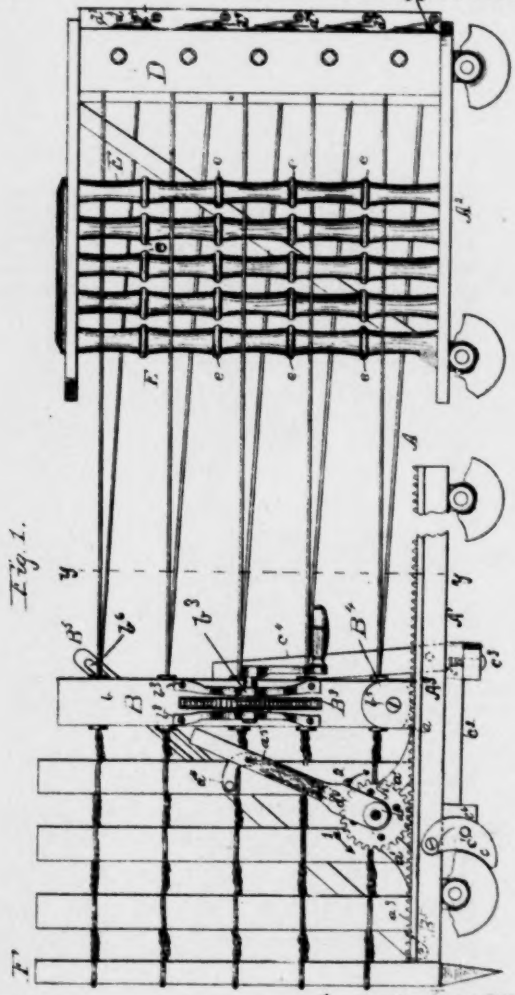
A represents the base-frame formed of two sections, A′ and A^2. The section A′ carries the twisting-frame and A^2 the reels and tension devices. Section A′ is formed of two parts, A^3 and A^4. Part A^3 has strips *a*, which overlap the sides of part A^4 and form guides for the latter. Upon the part A^4 are standards *a′*, which support a shaft a^2, having the cog-wheels A^5 keyed thereon. This cog-wheel meshes with the rack-bar a^3 on one of the strips *a*, and when operated by the lever A^6 moves the part A^4 backward or forward upon the part A^3. This lever is journaled on the shaft a^2, and is provided with a spring-pawl, a^6, which engages with the wheel between

(No Model.) 4 Sheets—Sheet 1.

S. WATSON.

WIRE FENCE MACHINE.

No. 322,872. Patented July 21, 1885.



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Geo. P. Byington

Inventor
Sam Watson
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(No Model.) 4 Sheets—Sheet 2.

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WIRE FENCE MACHINE.

No. 322,872. Patented July 21, 1885.

Fig. 2.

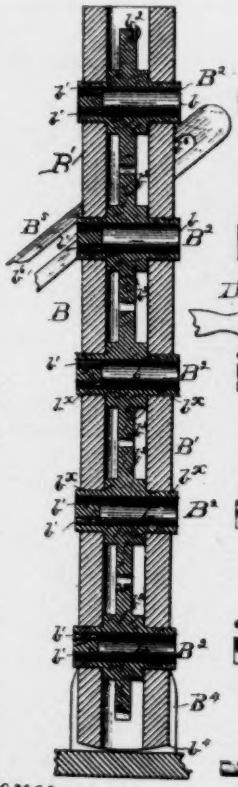
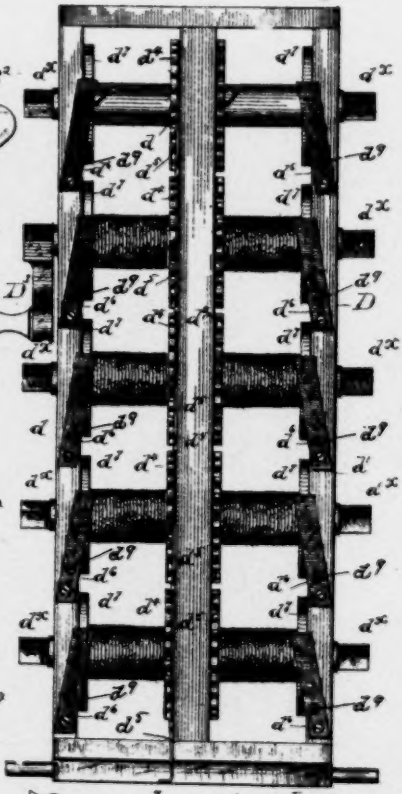


Fig. 3.



Witnesses:
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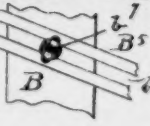
Geo. P. Byington.

Fig. 9.



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S. WATSON.

WIRE FENCE MACHINE.

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Fig. 5.

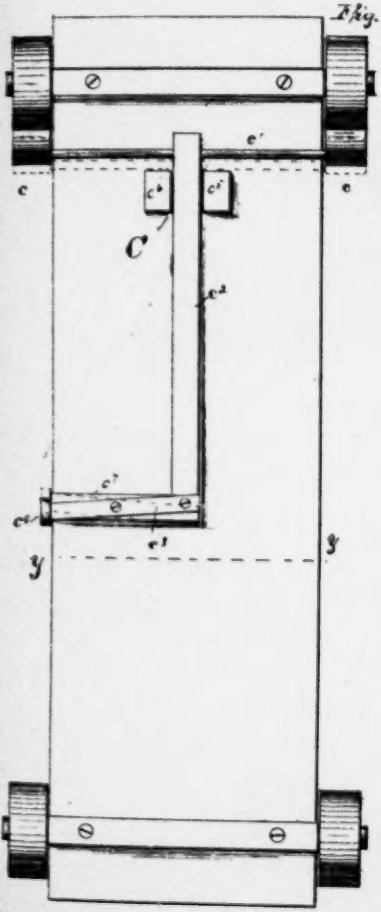
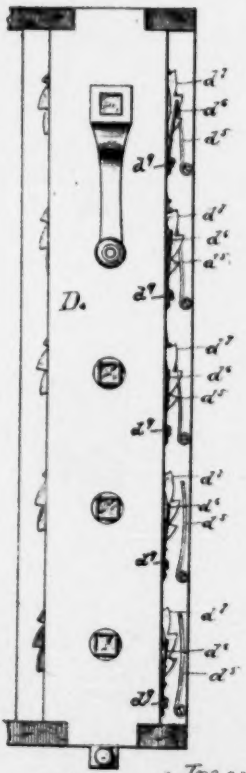


Fig. 4.



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WIRE FENCE MACHINE.

No. 322,872. Patented July 21, 1885.

Fig 6

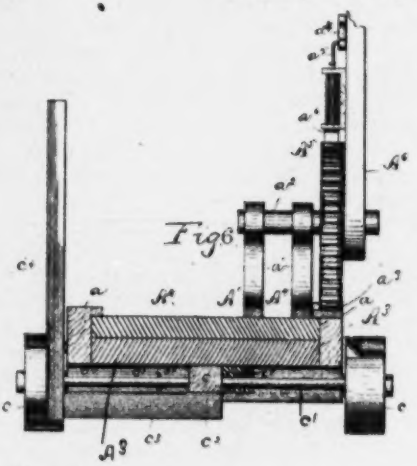

Fig 7

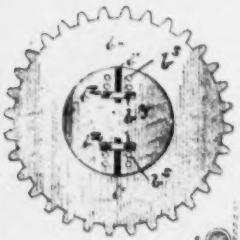

Fig 8.

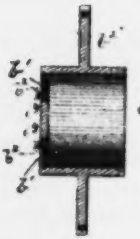

Fig 9.

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Geo. P. Byington

Inventor
Sam Watson
per Hallett & Hallett
Attys

the cogs, so that when the lever is pulled one way the wheel will turn in that direction, and force the part A^4 backward or forward as may be desired. By pressing downwardly upon the handle a^4 the link a^3 will lift the pawl from the cogs, so that the lever can be shifted to another space. By this construction I am enabled to move the part A^4 as far as desired, either backward or forward, and thus have complete control of the shifting parts, an object which is of the greatest importance, as will hereinafter be explained.

Upon the part A^4 is the upright twisting device B, which consists of the frame B′ and heads B^2. The frame B′ is provided with openings b^4 for the twisting-heads B^2, which are journaled therein. The heads B^2 consist of tubular parts b, having eyes b', and the pinion b^2, which meshes with the pinion next to it. The tubular part b forms the journals of the head and projects into the openings or bearings b^4 in the frame. If desired, the eyes b' may be elongated to form slots, as shown in Figs. 7 and 8.

To regulate the size of the slots or eyes b', the bars b^7 are provided. These bars have set-screws b^7, which screw into openings b^8 in the needle-head. The wire passes between the bars and bottom of the slots, and when the twisting-frame is in a vertical position the slot is reduced by placing the bar over the openings or holes nearest the bottom of the slot, and fixing said bar in place by means of the set screws. When the machine is tilted, the bar is moved to the next set of holes, so that the wire will not be bent in passing through the eyes. In other words, the slot permits the wire to pass out without bending whenever the frame is tilted, and the bar serves as a guide or bearing-face for the wire, so that it will not have too great play while being twisted.

Upon the frame are brackets b^3, which serve as bearings for the gear-wheel B^3, that meshes with one of the pinions, b^2, of the head. The gear-wheel is provided with a crank, by means of which motion is imparted to it and the heads. The frame B′ is rounded at its lower end, b^4, and provided with trunnions b^5, which are journaled in the standards B^4 to permit of the twisting-frame being tilted when the machine is worked on hilly or uneven ground, and keep the pickets in line. The tubular heads allow the wire to adjust itself to the variant conditions of the ground, so that no interference with the pivoted adjustment of the twisting-frame will take place.

To hold the twisting-frame in position, an arm, B^5, is provided. This arm is pivoted to the part A^4, and is provided at its upper end with a slot, b^8, through which a screw, b^7, is passed into the twisting-frame. When it is desired to incline the twisting-frame out of its normal position, the screw is loosened and the twisting-frame is free to move into the position desired. The screw slides in the slot of the arm, which adjusts itself to the movements of the loom. When the latter has reached its proper position, it will be rigidly held in place by simply tightening the screw.

Upon the under side of the part A^3 is a brake-gear, which consists of brake-shoes c, pivoted to the part A^3 in front of its wheels, a rod, c', connecting the brake-shoes, a bar, c^3, through which the rod c'

passes, a lever, c^3, to one end of which the draw-bar c^2 is pivoted, and the hand-lever, c^4, which is pivoted to the other end of the lever c^3 and fulcrumed upon the part A^3. Upon the under side of part A^2 are studs c^5 and c^6, which guide the bar c^2 and the cleat c^7, in which the lever c^3 is fulcrumed. In Fig. 6 the view of stud c^6 is obscured by the cleat c^7. Its position, however, is indicated by dotted lines. The object of this brake will hereinafter be described.

The section A^2, as before stated, carries the reel and tension devices. The reel-frame D is composed of three uprights, d d' d^2, in which the reels are journaled in two vertical series. One journal of each reel D′ projects outside the frame, and is provided with square ends d^x for a crank, D^3, which may be used to wind the wire on each reel and to set each wire separately. One of the main objects of this construction is to adjust each wire so that when the twisting-frame is inclined toward the pickets the upper reels will give off sufficient wire to make up for the increased distance between it and the twisting-frame, and take it up when the twisting-frame has been righted or brought to a vertical position. If the twisting-frame should be inclined toward the reels, the upper reels should be made to rewind enough wire to compensate for the decreased distance between them and the upper part of the twisting-frame. By this means the tension of all the wires can be made uniform, no matter what the position of the twisting-frame. If desired, each reel may be provided with a ratchet-wheel, d^4, and a pawl, d^5, which is pivoted to the upright d^2. On the uprights d and d' are flat springs d^6, which are in contact with the flange d^7 of the reels to prevent the wire from being drawn off too fast. In other words, it acts as a brake. The contact between the reel and the spring may be regulated by a set-screw, d^9. The principal devices, however, on which I rely for tension are the posts E, arranged in two parallel rows, Fig. 9, and having the raised part e to indicate the space for each wire. These posts, in addition to the tension they give to the wires, also take out all the kinks. In the drawings the wires are shown as passing between two of the posts. If I desire to increase the tension, the wires are passed between three or more posts, as may be necessary.

To rig the machine, a wire is wound upon each reel separately. When a sufficient quantity has been wound upon them, the loose ends are passed between the vertical posts, which take out the kinks, and also act as tension-regulators. The wires are now passed through the tubular heads, which have two eyes, one eye for each of the reels, on the same horizontal plane. The wires are now attached to the starting-post F. The part A^2 is placed at any desired distance from the first post, and the part A′ will be between said post and part A^2. The length of the wires is adjusted or made the same by winding the surplus upon the reels.

The operation of the machine is as follows: The part A′ is moved almost against the post, and held there by means of the brake, and about three twists given to the wires by means of the heads. The part A^4 is now moved back a sufficient distance to permit of the insertion of a picket between the wires and next to the twisted part.

The twisting-frame is now forced against the picket by turning the cog-wheel A^5 in the direction of the arrow 1. This movement jams the picket tight against the twisted part of the wires. The heads are given a half-turn to twist the wire between the twisting-frame and picket, which is now clamped tight in place. The twisting-frame is now gradually moved away from the picket by reversing the action of the lever A^6, as indicated by the arrow 2. The twisting-heads are revolved at the same time, and, by reason of the tension upon the wire, make a long twist between the pickets, without breaking the fiber or destroying their elasticity, which would be the case if the twisting-frame were held solidly against the picket while the heads were revolved. When the next picket is put in place, the operation is the same, except that the motion of the twisting-head is reversed, so that the wires will not be twisted between the twisting-frame and the reel. When the part A^4 has been worked forward upon the part A^3 until it is near the front end, the brake upon the wheels is loosened and the part A' moved back sufficiently to permit of the part A^4 being moved to its former position at the front end of the machine. The wires will keep the part A' in line with the post and part A^2, and thus prevent deviating from the course laid out. When the part A' has been moved up to part A^2, the latter is again moved off and affixed in place at any suitable distance.

What I claim as new is—

696-698 1. In a wire-fence machine, the combination of the part or truck A^3, the part A^4, held in place by ways on the part A^3 and connected to the latter by mechanism for shifting its position, a twisting-frame pivoted upon the part A^4, and the part A^2, having the reels and tension devices.

2. In a wire-fence machine, the combination of the stationary part A^3, the sliding part A^4, the twisting-frame having the tubular twisters and pivoted upon part A^4, and reels and tension devices for regulating the tension of the wire, substantially as described.

3. In a wire-fence machine, the combination of the parts A^3 and A^4, the part A^3 having the overlapping strips and rack-bar a^3, and the part A^4 having the cog-wheel journaled thereon and meshing with rack-bar a^3, and having the spring-pawl, substantially as described, whereby the twisting-frame can be forced against the picket and gradually withdrawn as the wire is twisted, substantially as described.

4. In a wire-fence machine, the combination of the part A^3, the part A^4, having the twisting-frame pivoted thereto, and the arm B^5 pivoted to the base and provided with the slot for the set-screws by which it is attached to the twisting-frame, substantially as described.

5. In a wire-fence machine, a tubular twisting-head having the elongated eyes and the bars for regulating the size of the eyes, substantially as and for the purpose described.

6. In a wire-fence machine, the combination of the twisting-frame and its supports and the part A^3, having the reel frame and reels, and the parts E, interposed between the reels and the twisting-frame, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

SAM WATSON.

Witnesses:

R. W. SWAIN.
DANIEL T. WHITE.

706

United States Patent Office.

WILLIAM F. DENNIS, of London, England.

Wire-netting Machine.

Specification forming part of Letters Patent No. 327,924, dated October 6, 1885. Application filed April 6, 1885. Serial No. 161,404. (No model.) Patented in England October 15, 1884, No. 13625.

To all whom it may concern:

Be it known that I, William Frederick Dennis, a subject of the Queen of Great Britain, residing in London, England, have invented certain new and useful improvements in wire-netting machines, of which the following is a specification.

My invention relates to the manufacture of wire-netting of the ordinary hexagonal mesh type, wherein four sides of each mesh are formed of single wire, while each of the remaining two sides are formed of double wires twisted together. Such netting is commonly furnished with approximately straight selvage wire at each edge, and occasionally with an additional central wire to assist in resisting longitudinal elongation.

According to the method hitherto commonly employed in the manufacture of wire-netting of the kind alluded to, two distinct series of wires are used, those belonging to one series being carried by bobbins mounted on fixed pins, while those belonging to the other series are formed into coils commonly known as "springs." These are sometimes inclosed within spools or tubular envelopes, and have lateral and rotative movements alternately imparted to them. The several bobbin-wires are led to and along the several spools, respectively, and pass through orifices in blocks which are capable of being rotated with the spools in such a manner that each pair of wires proceeding from the bobbins and spools, respectively, is capable of being twisted together the required number of times. The bobbin-wire guide-blocks and the spools are then moved laterally in opposite directions half the distance between the twists in the wire-netting, whereupon each bobbin-wire arrives opposite the next adjacent spool-wire, the newly-constituted pairs of wires being then twisted together, as before. A reverse lateral movement is subsequently imparted to the bobbin-wire guide-blocks and to the spools, thus restoring them to their previous positions, and bringing the wires in each series opposite those they originally corresponded with respectively. The series of operations described is then repeated.

This system of manufacture is objectionable on account of the limited space afforded for the spools, the diameter of which must necessarily be somewhat less than the distance between each two adjacent twists—that is to say, the diameter of the mesh measured across between its two opposite twisted sides. These spools can therefore be charged with only a comparatively small quantity of

wire, and this has to be formed into a closely-coiled mass in order to be introduced into the spool. In addition to the coil being thus limited in quantity, it is necessary for the wire of which it is composed to be of comparatively high quality and mild in character. Otherwise in coiling it to form the spring or in uncoiling it during the progress of the netting manufacture it is liable to fracture. The waste of material consequent on the use of short lengths of wire is also considerable, and much time is lost during the process of manufacture, owing to the machine having to be frequently stopped to permit of one or other of the spools being replenished and the new wire connected up to the portion of the netting already made.

The object of my invention is to overcome these objections, and for this purpose I employ a system of manufacture and mode of construction which permit both series of wires to be carried on bobbins, and the use of spools and springs to be dispensed with.

In carrying out my invention I employ apparatus such as represented in the accompanying drawings, whereof—

(Here follow diagrams marked pp. 699, 701, 703, 705.)

Figure 1 is a vertical longitudinal section; Fig. 2, a plan view; and Figs. 3, 4, 5, and 6 are sectional elevations.

Similar letters of reference will be used to indicate corresponding parts in all the figures.

a is a disk, mounted on a central shaft, *a'*, carried in bearings in the standards a^2 a^3. To the disk *a* a to-and-fro vibratory motion is imparted by means of the lever *b* and pin *b'*. The lever *b* is secured to a rocking shaft, mounted in the standard a^3, and is actuated by the lever b^3, as will be herienafter explained with reference to Fig. 3.

In the periphery of the disk *a* are mounted a series of semi-cylindrical spindles, *c*, each of which carries at one end a bobbin or reel, *d*.

707 Surrounding the disk *a*, and closely fitting its periphery, is a ring, *e*, secured to the foundation or framing of the machine by means of a leg, *e'*, on each side.

In the internal surface of the ring *e* is mounted a second series of semi-cylindrical spindles *c'*, each of which carries at one end a bobbin or reel, *d'*, these bobbins being arranged on the same side of the ring *e* as those on the disk *a*.

To the opposite end of each of the semi-cylindrical spindles *c* a pinion, *f*, may be secured for the purpose of rotating the said spindles; but I prefer, as a matter of convenience, to secure the pinions *f* to the spindles *c'*. The bobbin-carriers are shown in face view in Fig. 1*. The circumferential distances between the spindles, mounted, respectively, in the disk *a* and ring *e*, coincide. For the

(No Model.) 4 Sheets—Sheet 1.

W. F. DENNIS.

WIRE NETTING MACHINE.

No. 327,924. Patented Oct. 6, 1885

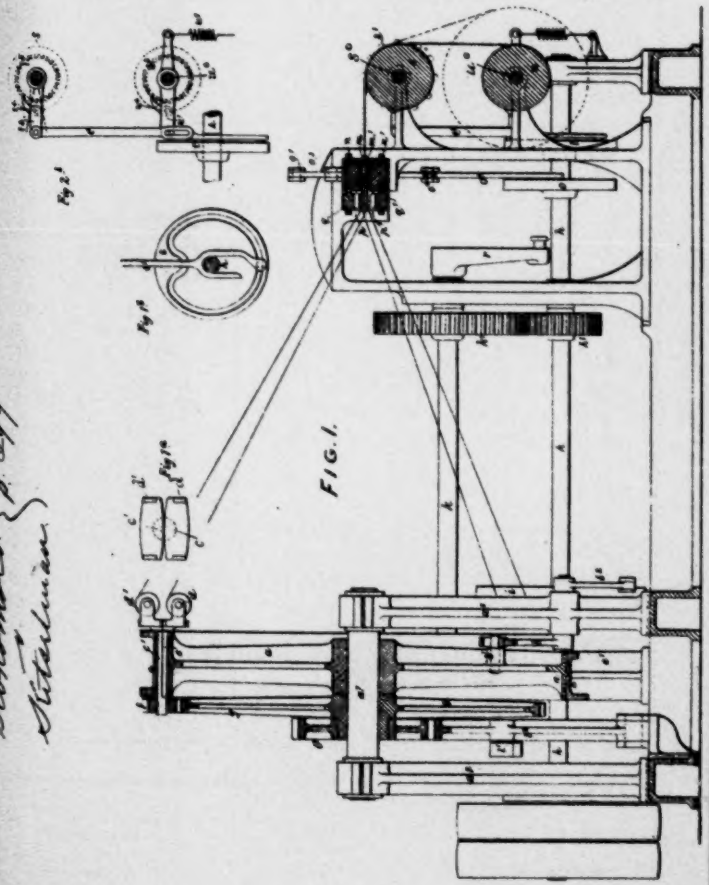


FIG. 1.

Witnesses.
Benj. Dawson
John Coolidge

Inventor
William Freeman Dennis
By his attorneys
Burke, Baker & Burke

(No Model.) 4 Sheets—Sheet 2.

W. F. DENNIS.

WIRE NETTING MACHINE.

No. 327,924. Patented Oct. 6, 1885

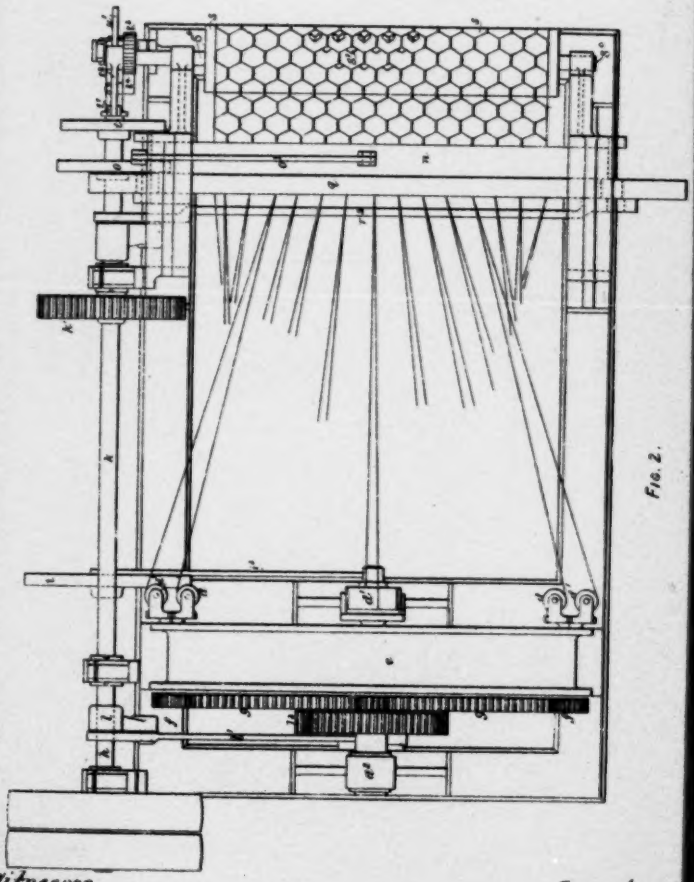


FIG. 2.

Witnesses.
Geo. Baumann
John Caplinger.

Inventor
William Frederick Dennis
By his attorneys
Burke, Parker & Howard

(No Model.) 4 Sheets—Sheet 3.

W. F. DENNIS.

WIRE NETTING MACHINE.

No. 327,924. Patented Oct. 6, 1885.

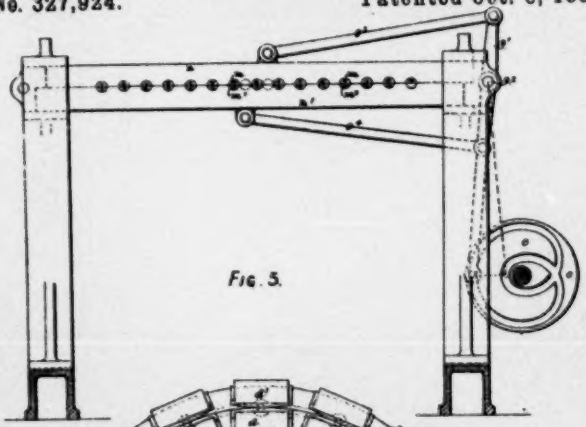


FIG. 5.

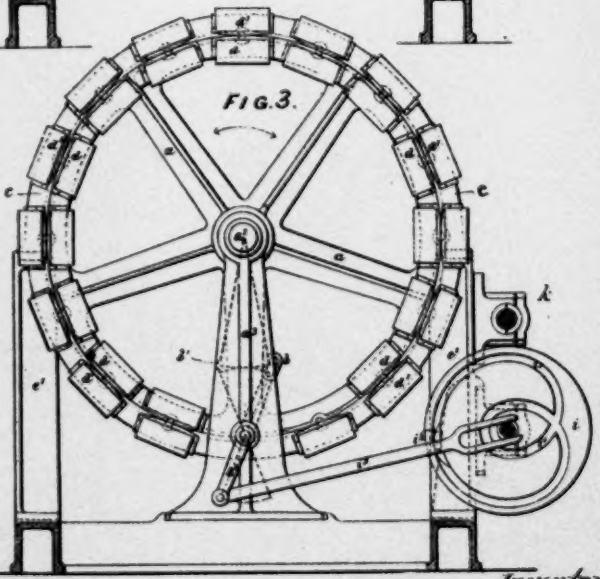


FIG. 3.

Witnesses.
E. C. Dawson
John Coplinger.

Inventor
William Ezekiel Dennis
By his attorneys
Burke, Haseltine & Lamb

(No Model.) 4 Sheets—Sheet 4.

W. F. DENNIS.

WIRE NETTING MACHINE.

No. 327,924. Patented Oct. 6, 1885.

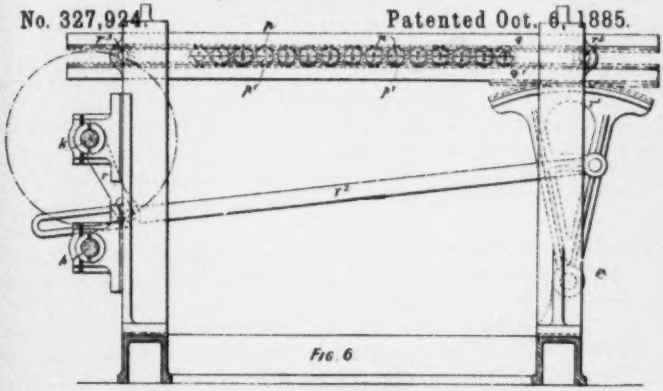


FIG. 6

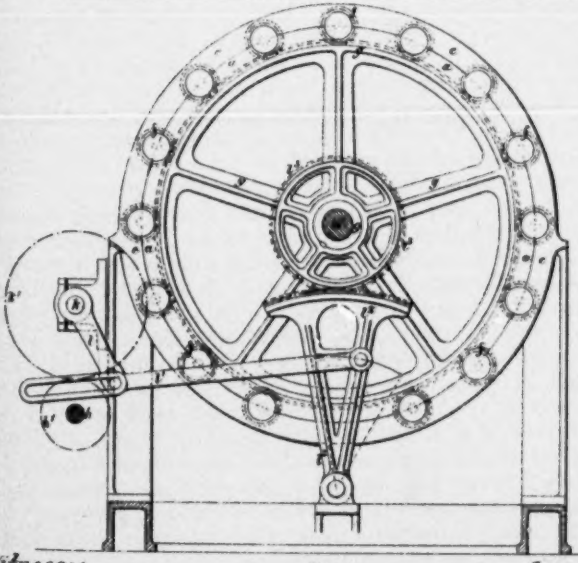
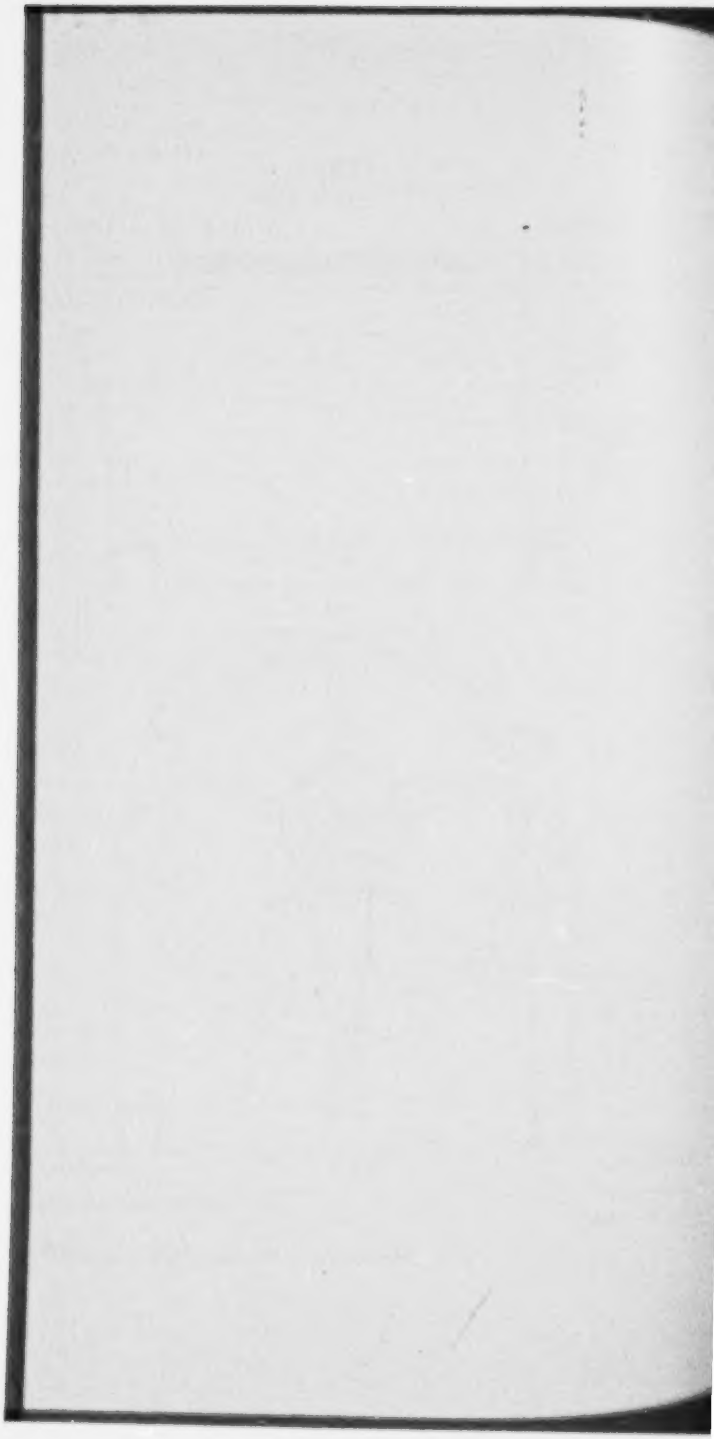


FIG. 4.

Witnesses
Geo. Dunwood
John Caplinger

Inventor
William Frederick Dennis
by his Attorneys
Burke, Fraser & Burnett



purpose of avoiding confusion in the drawings, Figs. 1 and 2, only a few of the spindles *c c'*, bobbins *d d'*, and pinions *f* are shown. The pinions *f* gear with a central toothed wheel, *g*, by means of which they may be rotated the required number of revolutions, according to the number of times each pair of wires is required to be twisted together in the formation of the netting, two to four twists being commonly employed. (The actuation of the toothed wheel *g* will be hereinafter explained with reference to Fig. 4.) Although only one of the series of spindles *c c'* is provided with driving-pinion *f*, it will be understood from the construction described that each of these, being semi-cylindrical, actuates its corresponding half-spindle in the other series, each pair of bobbins *d d'* being thus rotated about the common axis of the two half-spindles whereby they are mounted.

The disk *a* is caused to partake of a to-and-fro rotative or rocking motion by means of intermittently-acting mechanism, such as represented in Fig. 3, which shows a face view of that side of the disk *a* and of the ring *e* on which the bobbins *d d'* are arranged.

Upon the main shaft *h* is secured a cam, *i*, having in its face a groove, i^1, formed in two loops—an inner and an outer one—the two loops crossing one another. Sliding in the groove is a crescent-shaped piece i^2, mounted on a pin in the rod i^3. One end of this rod is guided by means of its forked end engaging with the shaft *h*, while the opposite end of the rod i^3 is connected to the lever b^3. Upon the shaft *h* and cam *i* being rotated the crescent-shaped piece i^2 remains during a considerable portion of the revolution at a constant distance from the center of the said shaft; but during the passage of the inwardly-inclining section of the groove past the crescent-shaped piece i^2 the latter is caused to pass into the inner loop of the cam-groove i', where it remains at a constant distance from the center of the shaft *h* during a further considerable portion of the revolution of the shaft and cam *i*. During the passage of the outwardly-inclining section of the groove i' past the crescent-shaped piece i^2 the reverse operation takes place. Thus during each successive revolution of the shaft *h* the connecting-rod i^3 is caused to make a reciprocative movement alternately in opposite directions, these motions being communicated by means of the levers b^3 and *b* to the pin b', and thus to the disk *a*, the motion being so adjusted that the circumferential travel of the periphery of the disk corresponds with the pitch of the several pairs of spindles *c c'* carrying the bobbins *d d'*. By these means the bobbins *d* are each brought opposite their next adjacent bobbins, *d'*, and after a certain interval are caused to return to their original positions.

It is obvious that the design could be varied and the same results arrived at by making the disk *a* stationary and the ring *e* movable; or both bodies might partake of a rocking or rotative motion, if preferred.

For rotating the pinions *f* and bobbins *d d'* apparatus of the kind more particularly represented in Fig. 4 may be employed, this being a back elevation of the disk *a*, the standard a^3, Fig. 1, being

removed. Upon the main shaft *h*, Fig. 1, is secured a spur-pinion, *h'*, which gears with a two-to-one toothed-wheel, *k'*, keyed on the counter-shaft *k*, the latter accordingly making one revolution to two revolutions of the shaft *h*. The extremity of the counter-shaft *k* carries a crank, *l*, Fig. 4, having a pin working a connecting rod, *l'*. One end of the rod *l'* is attached to a toothed sector, *l²*, and imparts a vibratory motion thereto. The opposite end of the connecting-rod *l'* is formed with a long slot, in which the pin of the crank *l* works, thus rendering the action of the crank inoperative during two portions of its circular travel, the toothed sector *l²* remaining at rest during these periods. The extremities of the slot may be furnished with elastic buffers, adjustable or otherwise, to ease the work on the crank-pin in overcoming the inertia of the parts it is required to set in motion. The toothed sector *l²* gears with a toothed wheel, *l³*, mounted on and secured to the hub of the toothed wheel *g*. By these means an intermittent rotative motion is imparted to the toothed wheel *g*, and this being in gear with the pinions *f*, the latter are caused to rotate a certain number of times in one direction, and then, after an interval of rest, to make a similar number of revolutions in the opposite direction.

The motions derived from the cam *i* and from the crank *l* are respectively so timed with reference to each other that the connecting-rod *i³* moves the disk *a*, while the pin of the crank *l* is traveling in the slot in the connecting-rod *l'*, and the connecting-rod *l'* operates the bobbin-pinions *f*, while the sliding piece *i²* remains in one or other of the concentric portions of the cam-groove *i'*.

At a convenient distance from the face of the disk *a* and ring *e*, carrying the bobbins *d d'*, is arranged apparatus for twisting the several pairs of wires together in the formation of the net-
708 ting. The mechanism for this purpose consists of two series of half-spindles, *m m'*, each series being carried in semi-cylindrical bearings respectively formed in the sliding bars *n n'*. The faces of the bars in which these bearings are formed are opposite to and in contact with one another, as more particularly shown in Fig. 5, and the pitch or distance laterally from center to center of adjacent bearings in each of the bars *n n'* corresponds with that desired for the mesh of the netting when measured across between two opposite twisted sides. Each of the bars *n n'*, carrying its series of half-spindles *m m'*, receives an intermittent reciprocative motion equivalent to half the aforesaid pitch, the motions of the two bars being, however, in opposite directions. The mechanism employed therefore consists of a double-groove-face cam, *o*, of the same character as hereinbefore described with reference to Fig. 3, mounted on and secured to the shaft *p*, and working a crescent-shaped sliding-piece carried by the lower extremity of the vibrating lever *o'*, the latter being mounted on a pivot, *o²*, and coupled to the bars *n n'*, respectively, by means of the connecting-rods *o³ o⁴*. Corresponding ends of the half-spindles *m m'* are furnished with half-pinions *p p'*, which, gearing with racks *q q'*, enable each pair of half-spindles *m m'* to be rotated about their common center. The mechanism employed for operating the racks *q q'* will be readily understood on

reference to Fig. 6. *h* is the main shaft; *k*, the counter-shaft, furnished with a crank, *r*, working a vibrating toothed sector, *r'*, by means of a slotted connecting-rod, r^2. The toothed sector *r'* gears with the rack *q'*, the motions of which are communicated but in reverse direction to the upper rack, *q*, by means of one or more pinions, r^3, mounted in fixed bearings. It will be perceived that the mechanism here employed is of the same character as previously described with reference to Fig. 4, and its action will be readily understood without further explanation. The motions are so timed that the reciprocation of the sliding bars *n n'* takes place to a certain extent concurrently with corresponding movements in the racks *q q'*. Otherwise the half-pinions *p p'*, being in gear with the racks *q q'*, there would be a tendency for the half-spindles *m m'* to be rotated before arrival in their new positions opposite one another. The requisite lateral movements having, however, been completed, the continued action of the racks *q q'* causes each newly-constituted pair of half-spindles to revolve about their common center.

The half-spindles *m m'* are each perforated longitudinally to permit the passage of the wires about to be employed in the formation of the netting.

The action of the apparatus is as follows: The wires from the several pairs of bobbins *d d'*, mounted on the disk *a* and ring *e*, and which with the mechanism appertaining thereto may be termed the "counter-twist" apparatus, are led through the several pairs of half-spindles *m m'* in the twisting mechanism, and, according to the number of twists desired in the netting, the several pairs of bobbins *d d'* and of twisting-spindles *m m'* are rotated. By means of the cam *i* the bobbins *d*, mounted in the disk *a* of the counter-twist apparatus, are then shifted opposite the respectively next adjacent bobbins, *d'*, carried in the ring *e*, and similarly by means of the cam *o* the half-spindles *m*, carried in the sliding bar *n*, are shifted opposite the respectively next adjacent half-spindles, *m'*, carried in the sliding bar *n'*, the combination of wires thereby established corresponding with that prevailing in the counter-twist apparatus. By means of the crank *r* and connected mechanism the various pairs of wires passing through the several pairs of half-spindles *m m'* are twisted together, the crank *l* and its connected mechanism causing the several pairs of bobbins *d d'* to make a similar number of revolutions in the same direction. By reverse movements the disk, as also the twisting-spindles, then resume their original positions and normal relationships, whereupon the twisting and counter-twisting operations are effected in the opposite direction.

From the foregoing description it will be perceived that a similarity of action prevails between the twisting and counter-twisting apparatus. This is in certain respects essential. But an important distinction is that whereas the twisting devices consist, primarily, of bipart spindles *m m'*, which must be placed close together, according to the requirements of the mesh, the space occupied by the bobbins *d d'* supplying the wires to these spindles is not subject to limitations prescribed by the size of the mesh to be produced.

Beyond the twisting mechanism is mounted upon a shaft, s^9, a

roller, s, the surface of which is provided with studs or other projections, s', as shown in Figs. 1 and 2, suitable for engaging in the meshes of the netting. In Fig. 2 only a portion of the roller surface is shown furnished with such studs by way of example. The roller s has imparted to it by means of suitable feed-gear an intermittent rotative motion, and operates to feed the wires through the machine by a pulling action as the netting is formed. The mechanism for performing this duty consists of a cam, t, secured on the main shaft h and operating a bar, t'. The arrangement of these parts is more fully shown in the detail views, Figs. 1^b, 2^b, the former of these being a face view of the cam, and the latter a side elevation showing the connection with the shaft of the feed-roller s. The bar t' carries at one end a roller projecting into the groove of the cam t, and is connected at the other end to a vibrating lever, t^2, mounted, by preference, freely on the shaft s^0 of the roller s. The bar t' is also forked across the shaft h, the latter being thus utilized for the purpose of guiding the said bar in its vertical movement. The motion derived from the cam t and bar t' is imparted to the roller s through
709 a ratchet-wheel, t^3, and pawl t^4, this mode of communication being preferred to keeping the lever t^2 to the shaft of the roller s and working the latter direct, as affording means for slightly varying the length of feed, an acceleration hereof being effected by substituting an interchangeable ratchet-wheel of smaller diameter. It will, however, be understood that the throw of the cam t should be determined in such a manner as to give as nearly as possible the correct amount of rotation to the roller s—that is to say, a circumferential motion corresponding with the distance the longitudinal rows of studs s' are apart.

The action of the feed mechanism is timed to take effect between the successive operations of the twisiing mechanism. Feed mechanism with constant or continuous action may, however, be substituted without affecting the essential features of my invention.

The netting, after passing over the feed-roller s, may be wound off upon a drum, u, mounted beneath upon a shaft, u^0, and capable of being readily removed when filled.

The feed mechanism already described may be utilized for the purpose of actuating the gathering-drum u. On the shaft u^0 of the drum u is mounted a lever, u', engaging at one end in a slot in the bar t', and loaded at its opposite extremity with a weight or spring, u^2. The shaft of the drum u is rotated by means of a ratchet-wheel, u^3, actuated by a pawl, u^4, mounted on the lever u'.

The action of the apparatus is as follows: The downward motion of the bar t', operating the lever, u', has the effect of drawing back the pawl u^4 and extending the spring u^2. During the return motion of the bar t', the spring u^2, acting on the lever u', pawl u^4, and ratchet-wheel u^3, rotates the drum u to an extent sufficient to coil or gather the length of netting delivered from the feed-roller s on the completion of each row of meshes. Inasmuch as the effective diameter of the gathering drum gradually increases as each coil of netting is wound upon it, while the rate at which the netting is made remains constant, it is necessary for the drum u to be rotated at each

operation of the machine through a gradually-diminishing arc; and it will be seen that by means of the apparatus described this result is effected, the pin of the lever u' failing to a greater and greater extent to remain in the top of the slot in the bar t' during the upward stroke of the latter. Thus the roller s may be described as actuated with a positive feed-motion, while that imparted to the gathering-drum u is of a permissive character.

In a machine of the character herein described, wire-netting may be manufactured of a width corresponding with the full number of a wires for which bobbins are provided on the disk a and ring e, or of any less width desired, subject to a minimum variation of half the width of a mesh; or two or more pieces of netting of the same or different widths may be produced simultaneously.

It will be perceived that instead of arranging the axis of the twisting-spindles m m' in the same horizontal plane, the spindles may be arranged in parallel, cylindrical, or segmental surfaces pivoted concentrically. Under such circumstances the twisting-spindles, during their lateral movements, travel in circular arcs instead of rectilineally, and for imparting the requisite rotative movements to the same, externally and internally geared toothed sectors mounted on the same center may be employed.

Although in the machine described I have preferred to employ two longitudinal shafts, h k, for imparting the requisite motions to the various parts of the apparatus, one shaft revolving at half the speed of the other, such an arrangement is not essential.

Having fully described my invention, what I claim, and desire to secure by letters patent of the United States, is—

1. In a machine for making wire-netting by a continuous process from reel-carried wires, the combination, with mechanism for automatically changing or shifting the individual wires and twisting the several pairs of wires together, of automatically-acting mechanism for imparting corresponding movements to the reels carrying said wires, these being mounted in the outer periphery of a disk and the inner periphery of a circumscribing-ring, substantially as set forth.

2. In an automatic machine for making wire-netting in which two adjacent wires are alternately twisted with each other and with their laterally-contiguous wires, the combination, with the disk provided with half-round bearings in its periphery, carrying one set of semi-cylindrical or half spindles, of the ring closely circumscribing said disk, and provided on its inner face with half-round bearings carrying the other set of semi-cylindrical or half spindles, said spindles being provided with reels or bobbins, and mechanism for imparting to-and-fro lateral movements to one of the said sets of spindle-bearings, substantially as and for the purposes set forth.

3. In a machine for making wire-netting, the means, substantially as described, for effecting the intermittent rotation of the several pairs of bobbin-spindles or twisting-spindles in opposite direction from a continuously-rotating shaft, such means comprising a rotating shaft, a crank mounted thereon, a slotted connecting-rod engaging with the pin of the said crank, and toothed gears connecting the

POOR COPY

said rod with the spindles, all arranged to operate substantially as set forth.

4. In a machine for making wire-netting from reel-carried wires, and wherein the part bearing one series of bobbin-spindles has imparted to it an intermittent movement, the mechanism, substantially as described, for imparting said movement, the same comprising the face-cam with a double-loop groove, the crescent-shaped sliding piece working in said groove, the connecting-rod carrying said sliding piece and actuated thereby, and means for connecting said rod with the part which bears the series of bobbin-spindles, all arranged to operate substantially as set forth.

710–712

5. In a machine for making wire-netting from reel-carried wires, the mechanism, substantially as described, for imparting intermittent lateral movements in each direction alternately to the parts carrying the twisting-spindles, the same comprising the face-cam with a double-loop groove, the crescent-shaped sliding piece working in said groove, the bar carrying said sliding piece and actuated thereby, and means for connecting said bars with the parts carrying the twisting-spindles, all arranged to operate substantially as described.

6. In a wire-netting machine, the means, substantially as described, for operating the feed-roller with a positive motion and the gathering-drum with a permissive motion, such means consisting of the cam t and reciprocating bar t', the latter actuating the feed-roller s by means of a ratchet and pawl, t^3 t^4, and permitting a spring or weight, u^2, to actuate the gathering-drum u by means of a ratchet and pawl, u^3 u^4, the connection between the bar t' and the lever u' being slotted, substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

W. F. DENNIS.

Witnesses:

ARTHUR DENNIS.
JAMES W. CLEMENTS.

(No Model.)

J. ANDREW.

BRAIDING MACHINE.

No. 337,473. Patented Mar. 9, 1886.

No. 148.
Kokomo Co. pf 7/3
Natural Gas

Fig. 2.

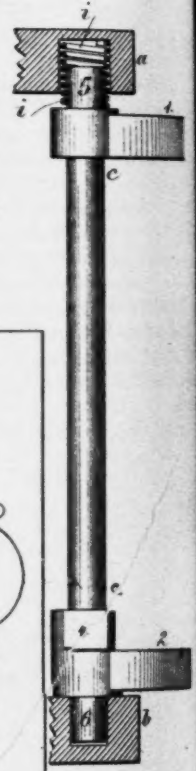
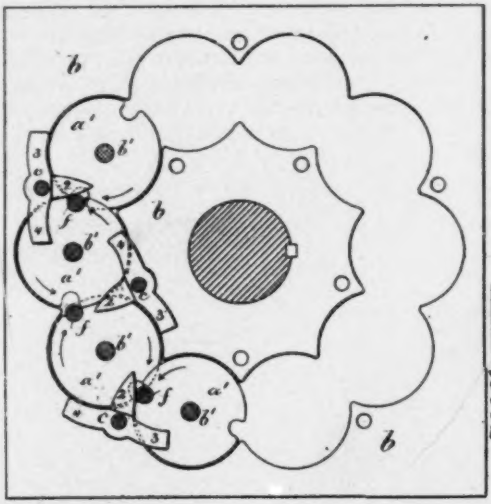


Fig. 1.



Witnesses
Chas. H. Smith
I. Hall

Inventor
John Andrew
per Lemuel W. Serrell
Atty

714-716 United States Patent Office.

JOHN ANDREW, of Birmingham, Connecticut, assignor to himself, and Thomas F. Stevenson, of Brooklyn, New York.

Braiding-machine.

Specification forming part of Letters Patent No. 337,473, dated March 9, 1886. Application filed December 27, 1884. Serial No. 151,290. (No model.)

To all whom it may concern:

Be it known that I, John Andrew, of Birmingham, in the county of New Haven and State of Connecticut, have invented an improvement in braiding-machines, of which the following is a specification.

In braiding-machines of the nature shown in figure 1, the puppets or spindles that carry the bobbin are directed in their courses through the race-circles formed of the slotted guide-plates by turning shafts with projections upon them termed "winglets" or "directors." These winglets are between the upper and lower plates, and pivoted at their ends in recesses or holes in such plates. These winglets are turned to guide the puppets, and they are subjected to sudden movements, and they are liable to rebound in cases where the speed is increased beyond an established rate. If the winglet rebounds or partially turns, the puppet moving in one direction is liable to be brought into collision with that going in the other direction.

My improvement is for holding the winglets in their proper positions, and at the same time allowing them to turn freely to direct the puppets as they are moved along through the slotted plates known as the "race-circles."

(Here follows diagram marked p. 713.)

In the drawings, Fig. 1 is a sectional plan of a portion of the lower part of a braiding-machine to which my invention is applicable, and Fig. 2 is an elevation of my improved winglet, portions of the slotted guide-plates, together with the spring for the winglet, being shown in section in this figure.

The slotted guide-plates *a* and *b* are precisely alike, and the openings in said plates are occupied by disks *a'* upon vertical shafts *b'*, (see Fig. 1,) supported in any suitable manner. The shafts *b'* are geared together so that the adjoining disks *a'* are rotated in opposite directions, as indicated by the arrows. Each disk *a'* is made with two notches in its edge upon opposite sides, of a size to receive the spindle *f*, carrying the bobbin, and the duty of the winglets is to direct the passage of the spindles from disk to disk, so that they will travel in their proper courses.

As braiding-machines of this character are well known, no further description of said machines is believed necessary. The winglet has the projecting guides 1 2 and the cam-arms 3 4, and at the ends of the connecting-shaft are the pivots or arbors 5 6. These, all being of ordinary construction, do not require further description.

In the plate *a* are the holes or cylindrical recesses for the pivots 5 of the winglets; but instead of these holes being of a size to fit the pivots, I bore out each hole sufficiently large to receive the helical spring *i*. This spring is of a length greater than the length of the pivot 5, and of an internal diameter adapted to receive such pivot. It will now be understood that where the winglets are introduced into place between the plates *a b*, with a spring, *i*, around each pivot 5, such springs *i* will be slightly compressed and act endwise upon the winglet and produce a slight friction against the hub of the projecting guide 1 and of the hub of the guide 2 upon the plate *b*; hence such winglets, although partially turned in the usual manner, will not be subject to any rebound or false motion in consequence of the inertia of the winglet, and the speed of the machine can be greatly increased without risk of the parts becoming misplaced. This friction-spring *i* occupies but little space. The machine does not have to be changed except to enlarge the holes for the pivots 5, and the wear of the pivots is less because the spring is similar to a loose bushing to the pivot; hence the efficiency and durability of the machine are augmented.

I claim as my invention—

The combination, with the slotted guide-plates *a b*, the bobbin-spindles, the carriers *a'*, and the winglets between said plates, of a helical spring, *i*, around one pivot of each winglet, the recess or hole for said pivot being enlarged to receive the spring, as specified.

Signed by me this 22d day of December, A. D. 1884.

JOHN ANDREW.

Witnesses:

GEO. T. PINCKNEY.

WILLIAM G. MOTT.

2 Sheets—Sheet 1.

W. H. REPPETO.

WIRE FENCE MACHINE.

No. 347,064. Patented Aug. 10, 1886.

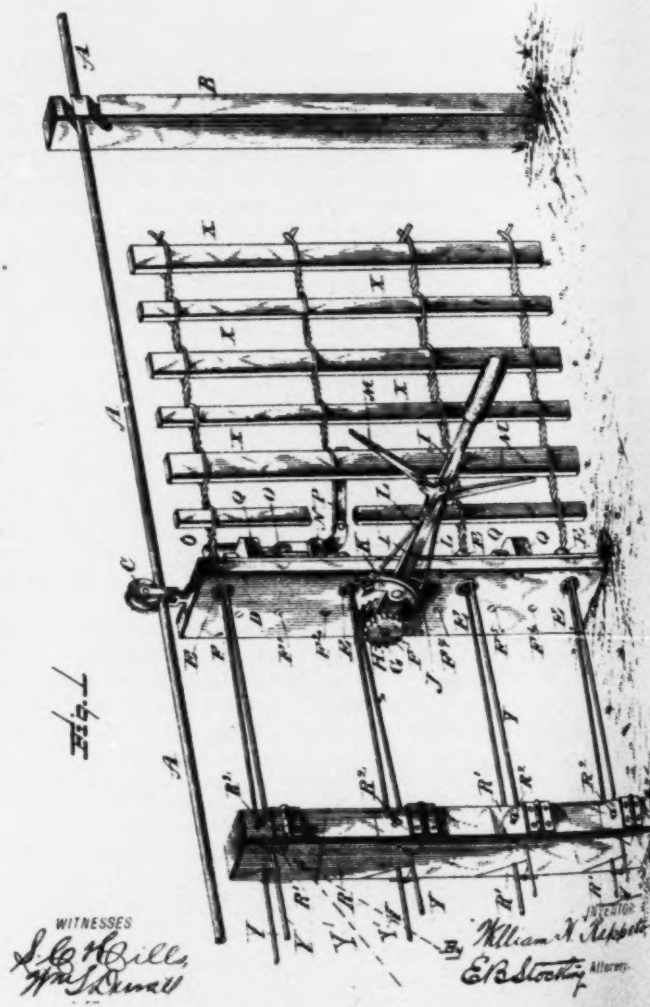


Fig. 1.

WITNESSES

L. C. Hills

Wm. S. Dunn

INVENTOR

William H. Reppeto

By E. B. Stocking Attorney.

(No Model.) 3 Sheets—Sheet 1.

W. H. REPPETO.

WIRE FENCE MACHINE.

No. 347,064. Patented Aug. 10, 1886.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 3.

Fig. 2.

Fig. 7.

WITNESSES
S. G. Wills,
Wm. Howell

INVENTOR
By William H. Reppeto
E. B. Stocking
Attorney

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United States Patent Office.

WILLIAM H. REPPETO, of Flora, Indiana.

Wire-fence Machine.

Specification forming part of Letters Patent No. 347,064, dated August 10, 1886. Application filed May 10, 1886. Serial No. 201,698. (No model.)

To all whom it may concern:

Be it known that I, William H. Reppeto, a citizen of the United States, residing at Flora, in the county of Carroll, State of Indiana, have invented certain new and useful improvements in wire-fence machines, of which the following is a specification, reference being had therein to the accompanying drawings.

(Here follow diagrams marked pp. 717 & 719.)

This invention relates to wire-fence machines which are intended to twist wire strands about pickets, and to do this at the place where the fence is to be built; and among the objects of the invention is the provision of a mechanism for operating the twisters which will permit of a close approach of the machine to a post or other fixed object in the line of fencing.

Other objects and advantages of my invention will appear in the following description, and the novel features thereof will be particularly pointed out in the claims.

Referring to the drawings, figure 1 is a perspective of a fence-machine embodying my invention and of a portion of a fence as constructed thereby. Fig. 2 is a side elevation of the machine. Fig. 3 illustrates the system of gearing employed. Figs. 4, 5, 6, and 7 are details, hereinafter described.

Like letters refer to like parts in all the figures of the drawings.

A represents a bar or rod, which serves the function of a track along which the twisting mechanism is moved. The track is supported by posts B, which may be the fence-posts with which the pickets are connected by the strands. In this instance a single roller, C, supports the machine D, in which are arranged twisters E, one for each pair of strands in the fence.

Referring to Fig. 3, which is an elevation of the frame-work D with the face-plate removed, the circumferential lines of the gearing and the twisters being shown in dotted circles, while their hubs or bearings are shown in full-line circles, as are also the bolt-holes for the face-plate connecting-bolts shown in Fig. 2 at *a*, it will be seen

that four twisters are arranged in a perpendicular line with each other and at one side of the frame-work or casing of the machine, and that they are connected with each other by means of a series of gears, F to F^6, inclusive, arranged in a similar line with each other at one side of the twisters. The gear F^3 is the driving-gear of the system, while the twisters mesh with the gears F, F^2, F^4, and F^6, this arrangement rendering the gears F' F^3 F^5 intermediate gears or idlers. When the gear F^3 is rotated or partially rotated in one direction, as indicated by the arrow thereon, all of the twisters are rotated in the same direction.

On the shaft of the gear F^3 are mounted two ratchets, G and H, each having the operative faces of its teeth opposite to those of the other, and upon said shaft, between the ratchets, is mounted pivotally a lever, I, carrying two pawls, J K, one on each side of the lever, and each extended beyond its pivot and connected by a rod, L, to a bell-crank lever, M, pivoted to the main lever I, so that when either of the bell-cranks is swung down into line with the main lever the rod L draws upon the extension of the pawl and throws its opposite end into mesh with the ratchet co-operating therewith, so as to convey the motion of the lever I to the gear F^3, the ratchets being rigidly secured to the shaft thereof. By using the other ratchet the gearing and twisters are rotated in an opposite direction. This construction and arrangement of the power-applying devices is more compact and convenient than the ordinary crank and miter-gear connection, as the main projection is lateral with relation to the fence, and hence the machine itself can be operated more closely to a post or other object in the line of the fence. So, also, the arrangement of all of the twisters at one side of the machine permits of the use of either independent posts for the support of the track or rail A, or for that purpose the rail may be supported at the opposite side of the ordinary fence-posts to that to which the strands are secured. Again, the arrangement of the twisters and twister-operating gear in parallel vertical lines tends to balance the machine when suspended by a single roller, so that the same operates more smoothly and is more conveniently moved from point to point during the operation of building the fence.

On the side of the machine opposite the gear-operating lever I is a bracket, N, in which is pivotally supported a lever, O, having at one end below its pivot a spacing-hook, P. (See Fig. 2)

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One arm, N′, of the bracket is formed after the manner of a ratchet, (see Figs. 5 and 7), into which the pawl P′, pivotally mounted on the lever O, takes, so that when the free end of the lever O is forced in a direction from the machine, the spacing-hook P being placed upon the picket X, as clearly shown in Fig. 1, the machine is drawn toward the picket, so that a freshly-inserted picket will be firmly held in position by the spacing-blocks Q, secured to or formed as a part of the machine. In this instance the faces of the blocks Q are recessed and adapted to receive removable spacing-blocks Q′, which are preferably wedge-shaped and provided with beveled edges to fit the dovetail recesses of the blocks Q, so that thicker or thinner blocks Q′ (see dotted lines, Fig. 4) may be inserted in the main

blocks, to adapt the machine to build fences in which the spaces between the pickets vary, or to adapt the machine to weave alternate wide and narrow pickets. This latter object, however, is also accomplished by means of the pawl-and-ratchet mechanism P′ N′, hereinbefore described. The twisters consist of a gear-wheel, E, having a hollow journal, E′, over one end of which is placed a cup, E^2, the bottom of which is perforated, as at E^3, for the passage of the wires to be twisted about the pickets. The cup is secured in position by means of a pin, bolt, or screw, E^4. By this construction cups provided with perforations for different-sized wires may be substituted for each other.

The tension device comprises an upright standard or post, R, which may be connected permanently with the usual spool-frame or other apparatus for supporting the wires in the form of coils; or said beam may be supported independently in any suitable manner in line with the fence being built. At opposite edges of the beam or post R are pivotally secured triangular blocks R′, the beam being cut away to receive the same. Screws or bolts R^2 serve to force the blocks firmly against the inclined walls of the recesses formed in the edge of the beam, post, or standard, so as to bind the strands Y therein and produce the desired tension. A suitable guy or guys, Y′, (see dotted lines, Fig. 1,) are employed for securing the tension-post R in position.

The operation of the machine will be readily understood by persons skilled in this class of inventions from the description hereinbefore given.

In Fig. 7 there is illustrated a modification of the spacing devices, which consists in mounting the lever O upon a bracket, N′, the ratchet-teeth of which are substantially square, in order to receive a square pawl, P′, whereby a single pawl serves to hold the lever O against movement in either direction. If desired, the main lever I of the machine may be provided with a single pawl and ratchet having teeth of the same character as that shown in Fig. 7.

From the lever O, beyond its pivot, there extends a rod, P^4, which is connected to a bell-crank lever, P^3, mounted on a bracket, P^3, which lever is pivotally connected to one of the spacing-hooks P, and from the lever O, and at a point between its free end and pivot, another connecting-rod, P^5, extends to a lever, P^6, pivoted to a bracket, P^7, of the frame D of the machine, which lever P^6 is pivotally connected to the other spacing-hook P. Now, it will be noticed that when the lever O is oscillated in one direction the hooks P are drawn toward the frame D, and when the lever is oscillated in the opposite direction the hooks are moved away from the frame, so that spacing-hooks arranged near each end of a picket may be operated to determine the position of the machine from the last picket inserted, and by means of the several notches in the bracket N′ said spaces may be adjustably determined.

It will be noticed that in the system of gears, F to F^6, employed each meshes directly with the other, and that the twisters are introduced into the system so as to receive motion from and yet so as not to be employed to drive or give motion to the system, and the

twisters are all driven in uniform directions by being in mesh with the first, third, fifth, and seventh gears, and, furthermore, the power is applied, not to a twister, but to a gear, whereby all lost motion is taken up before either twister is moved to twist one set of strands of the fence more than another.

Having thus fully described my invention and its operation, what I claim is—

1. In a machine of the class described, the combination of a frame-work or case, a series of directly-intermeshing gears, and a series of twisters arranged to separately mesh therewith, substantially as specified.

2. In a machine of the class described, the combination of a system of directly-intermeshing gears, a series of twisters meshing laterally with the same, a ratchet fixed to the shaft of one of said gears, and a pawl-and-ratchet lever loosely mounted on said shaft, substantially as specified.

3. In combination with a system of gears and twisters arranged side by side, a pawl-and-ratchet mechanism mounted upon one of the intermediate gears, and a series of twisters meshing with the first, third, fifth, and seventh gear- in the system of gears, substantially as specified.

4. In a machine of the class described, a spacing mechanism comprising a spacing-hook connected with a lever having a pawl and pivoted to a bracket a portion of which is formed as a ratchet, substantially as specified.

5. In a machine of the class described, a spacing block or bracket the face of which is dovetailed and provided with a removable bearing-block, subsfantially as specified.

6. A tension device for a machine of the class described, comprising a standard having opposite angular recesses, triangular
722–724 blocks movably mounted in said recesses, and means for adjustably forcing and retaining the blocks within the recesses, substantially as specified.

7. The combination of the gear F^3, ratchets G H, lever I, pawls J K, rods L, bell-cranks M, the gears F F′ F^2 F^4 F^5 F^6, and the twisters E, substantially as specified.

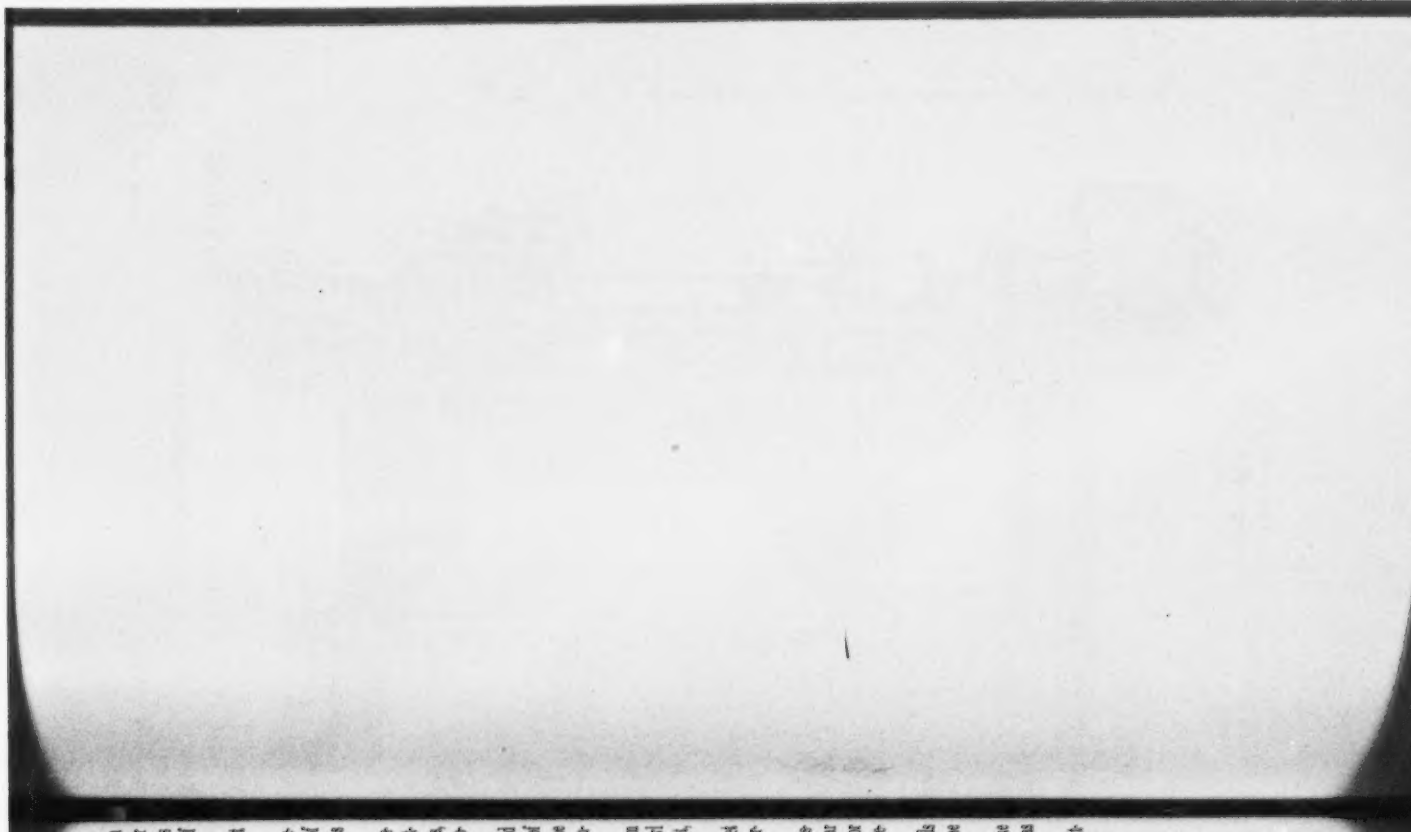
8. In a machine of the class described, the combination of the bracket N N′, lever O, pawl P′, and the hook P, substantially as shown and described.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM H. REPPETO.

Witnesses:

JOS. A. BRIDGE.
ISAAC PRITCHARD.



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A. J. BATES.

WIRE BARBING MACHINE.

No. 357,653. Patented Feb. 15, 1887.

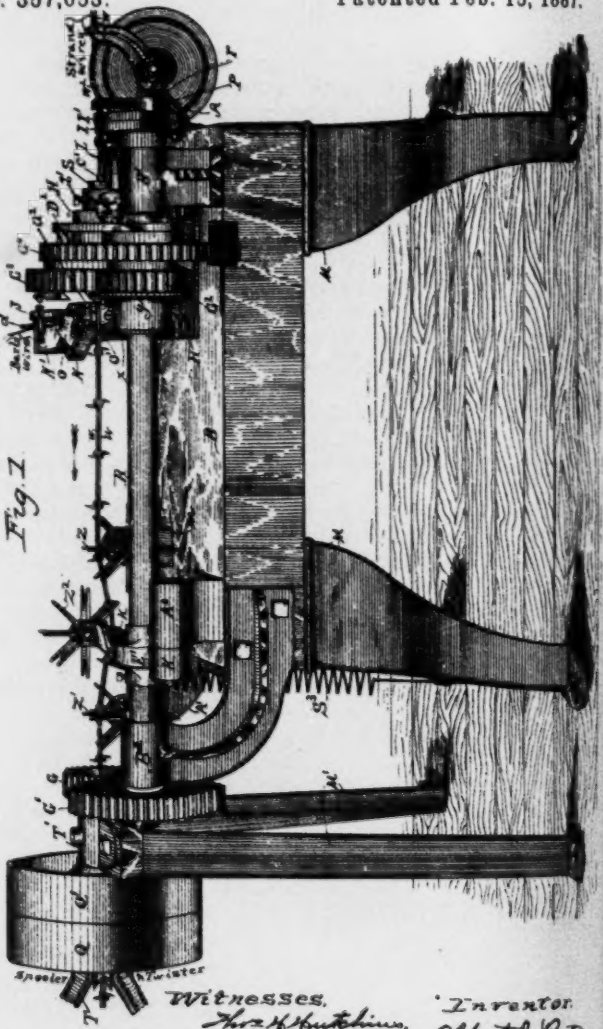


Fig. 1.

Witnesses.
Thos. H. Hutchins.
Wm. J. Hutchins

Inventor.
Albert J. Bates

Patented Feb. 15, 1887. Hutchins & Hutchins Attorneys. No. 357,653.

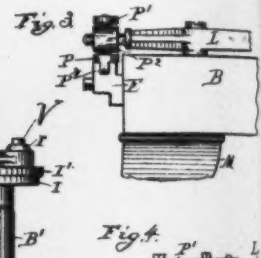
(No Model.) 3 Sheets—Sheet 1.

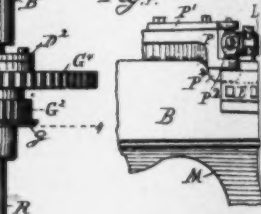
727

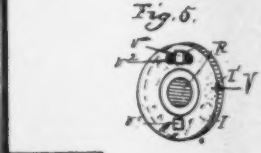
A. J. BATES

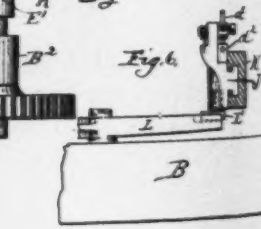
WIRE BARBING MACHINE.

No. 357,653. Patented Feb. 15, 1887.









Witnesses,
Chas. F. Gutting
Hugh Gutchins.

Inventor.
Albert J. Bates.

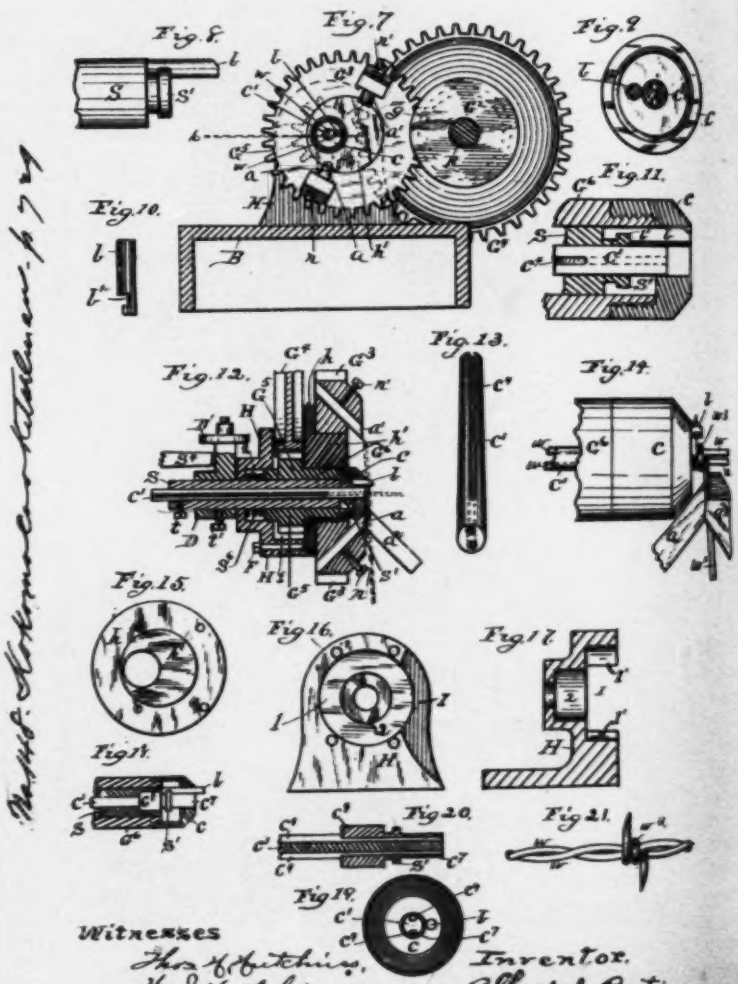
Mathias Koerner Co. Litho. Milwaukee. No. 727

(No Model.) 3 Sheets—Sheet 1.

A. J. BATES.

WIRE BARBING MACHINE.

No. 357,653. Patented Feb. 15, 1887.



Witnesses
Thos. H. Hutchins,
Wm. J. Hutchins.

Inventor.
Albert J. Bates.

730

United States Patent Office.

ALBERT J. BATES, of Joliet, Illinois.

Wire-barbing Machine.

Specification forming part of Letters Patent No. 357,653, dated February 15, 1887. Application filed November 23, 1886. Serial No. 219,598. (No model.)

To all whom it may concern:

Be it known that I, Albert J. Bates, a citizen of the United States of America, residing at Joliet, in the county of Will and State of Illinois, have invented certain new and useful improvements in wire-barbing machines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to certain improvements in wire-barbing machines, the construction and operation of which are fully set forth and explained in the following specification and claims, reference being had to the accompanying drawings and the letters and figures of reference marked thereon, which form a part of this specification.

(Here follow diagrams marked pp. 725, 727, 729.)

Referring to the drawings, figure 1 is a perspective view, taken from one side of the machine, representing the machine as it appears when in operation. Fig. 2 is a top plan view of the machine. Fig. 3 is a detailed broken-away portion of the machine, looking at the corner thereof, as indicated by arrow 1 of Fig. 2. Fig. 4 is a similar view, looking at the corner of the machine, as indicated by arrow 2 of Fig. 2. Fig. 5 is a perspective view of the adjustable crank-disk of the machine for imparting motion to the barb-wire-feeding mechanism. Fig. 6 is a detailed broken-away portion of the machine, looking at the side thereof, as indicated by arrow 3 of Fig. 2, and representing a cross-section of the standard of the barb-wire-feeding mechanism, taken on dotted line *x* of said figure. Fig. 7 is a vertical cross-section of the machine in front of the barb-coiling mechanism, taken on dotted line 4 of Fig. 2. Fig. 8 is a detailed view of one end of the sleeve of the barb-coiling mechanism of the machine, in which the center which guides the strand-wires is arranged, and of the barb-coiling pin, showing the manner of connecting said pin and sleeve. Fig. 9 is a rear plan view of the screw-cap and a cross-section of the center and coiling-pin of the barb-coiling mechanism of the machine. Fig. 10 is a side view of the barb-coiling pin. Fig. 11 is a detailed view of a portion of the barb-coiling

mechanism of the machine, showing a longitudinal section of the screw-cap, and also of a portion of both the sleeve and hub of the coiling-pinion upon which the said screw-cap is fitted, also showing a side view of the barb-coiling pin and a portion of the center. Fig. 12 is a horizontal sectional view of the barb coiling and cutting mechanism of the machine, taken on line 6 of Fig. 7, omitting the standard for supporting the stationary cutter; also showing a sectional part of the gear which imparts motion to the said coiling mechanism. Fig. 13 is a perspective view of the center for guiding the strand-wires through the barb-coiling mechanism of the machine. Fig. 14 is an exterior view of the parts shown in section in Fig. 11; also showing the strand-wires in position and the coiling-pin in the act of coiling a barb on the strand-wires, and also showing a portion of the stationary barb-cutter and one of the rotating barb-cutters. Fig. 15 is a face view of a disk having a face-stud, upon which the gear supporting the rotating cutters of the machine is arranged, and through which the barb-coiling head is eccentrically arranged. Fig. 16 is a face view of the head which supports the barb-coiling mechanism and the rotating barb-cutters of the machine. Fig. 17 is a central vertical longitudinal sectional view of the same. Fig. 18 is a detailed sectional view of the coiling-head of the machine. Fig. 19 is a face view of the same. Fig. 20 is a detailed sectional view of a portion of the coiling-head mechanism of the machine; and Fig. 21 is a perspective view of a section of barbed wire, representing a product of the machine.

Referring to the drawings, B represents the bed of the machine, supported on suitable legs, M, which bed bears upon its upper surface the principal working parts of the machine.

R is the main drive-shaft, journaled in boxes B' B^2, and located at one side of the machine above the bed, as shown in Figs. 1 and 2. The end of said shaft next the twister T is provided with pinion G', which meshes with hollow pinion G of said twister, journaled in box T'. The opposite end of said shaft is provided with the pinions G^2 G^4, which pinions drive the barbing parts of the machine. The extreme rear end of said shaft is provided with the crank-disk I, for driving the barb-wire feed.

H is a standard-box secured to the upper face of said bed, 731 and is formed as shown in Figs. 2, 12, 16, 17. This box contains the coiling-pinion G^5, which meshes with pinion G^4, which drives it. The chamber 2 of said box (shown in Figs. 12, 16, 17) forms a box for the rear part of the hub of said coiling-pinion, as shown in Fig. 12, and is long enough for containing a coil-spring, S^6, to yieldingly press said coiling-pinion forward. A face-plate, h, secured to the face of said standard-box H by means of the bolts F, serves to secure said coiling-pinion therein, and forms a journal-bearing for the forward-extending part of the hub of said coiling-pinion, as shown in Fig. 12. The chamber I in said standard-box containing said coiling-pinion has sufficient depth to permit a reciprocating movement of said coiling-pinion therein. Said standard-box H is cut away at one side, as shown at I', Figs. 16 and 17, so

the coiling-pinion can mesh with pinion G^4, as shown in Figs. 2 and 12 and in dotted lines in Fig. 7.

The plate *h* is provided on its outer face with an extending stud, *h'*, forming a spindle, upon which is placed the gear-wheel G^3, which holds the rotating barb-cutters *a* and *a'*, and which meshes with pinion G^2, and is held on said spindle or stud by means of the extending side flange, *g*, of said pinion G^2, as shown in Figs. 2 and 7. Said stud has an aperture passing through it longitudinally, forming the journal for the forward end of the hub of the coiling-pinion, which aperture or journal is eccentric to the periphery of said stud, as shown in Fig. 15. The forward end of the hub of the coiling-pinion (shown at G^6) is reduced in size and screw-threaded, and C is a cap, of the same diameter, that screws on the screw-threaded outer end of said hub G^6, as shown in Figs. 11, 12, 14. Said cap is reduced in diameter at its outer end, as shown in said figures, so it may not interfere with the stationary barb-cutter, as shown in Fig. 14, and is provided with a central longitudinal aperture for the reception of the outer end of the strand-wire guide C', and a similar aperture at the side of said first-named aperture for the reception of the reciprocating coiling-pin *b*. When the cap C is thus screwed on the end of said hub, it becomes a part thereof, and the threads in it and on said hub are turned in the direction so that when said hub rotates it tightens said cap thereon and causes it to rotate therewith, and also carry the reciprocating coiling-pin *b* around the strand-wires. The cap C is made removable, so it can be replaced when worn without having to substitute an entire new coiling-pinion, and also for the purpose of rendering it easier to replace said coiling-pin by another when necessary.

Figs. 7, 9, and 19 are face views of said cap, showing said apertures.

S is a reciprocating tube or sleeve arranged within the hub of said coiling-pinion, extending from the rear side of cap C through the rear part of standard-box H, as shown in Figs. 1, 2, and 12, and has secured on its rear end, by means of set-screw *t'*, the stud D, bearing a friction-wheel, D', for engaging with segment-cam D^2 on shaft R, by means of which cam said sleeve is reciprocated, as shown in Figs. 1, 2, and 12.

The coiling-pin *b* is located in a longitudinal aperture through cap C at one side from its center, and attaches to reciprocating sleeve S by means of the notch *b'* on its inner end, as shown in Figs. 11, 12, 18, and is reciprocated by means of said sleeve, which does not rotate. The cap C, containing said coiling-pin, having been screwed on the hub of coiling-pinion G^5, as hereinbefore stated, really becomes a part thereof and rotates therewith, and necessarily rotates the coiling-pin *b*, both around said sleeve and the strand-wires passing through it, for the purpose of engaging the barb-prods to coil them around the strand-wires.

A removable strand-wire guide, C', passes through said sleeve S, and is arranged therein so its forward end will be flush with the face of cap C, and its rear end extends a little beyond the end of said sleeve and is held secure therein by means of a set-screw, *t*.

This strand-wire guide is provided with a pair of opposite channels, C^4, extending from its rear end to near its forward end, where they connect with apertures extending through its forward end, as shown in Figs. 11, 12, and 13. These channels and apertures are for the reception of the strand-wires W W and guide them through the coiling-pinion.

The pinion G^3 is provided with a pair of oppositely-arranged adjustable rotating barb-cutters a and a', held in their proper places by means of the set-screws n and n', and are intended to shear with the stationary barb-cutter a^2, seated in a channel in standard N, and held in place by cap-plate O and proper cap-screws, as shown in Figs. 1 and 2; and immediately back of said cutter a^2 is secured a block, O′, which serves to properly guide the barb-prods past said standard N, and is adjusted by means of the set screw X.

N′ is an extension of standard N, and arranged at a slight angle with bed B, as shown in Figs. 1 and 2, and is provided with a groove at one side for the reception of the reciprocating head J, having a spring gripping-dog, d, and a gripping-block, d^2, for gripping and feeding forward intermittingly the barbing-wire W^2. (See Figs. 2 and 6.) A small guide or eyelet, d', is attached to the extending part N′ of standard N, as shown in Fig. 2, and is for the purpose of guiding the barbing wire W′ to the grip block d^2. Said barb-feed is operated by means of crank-disk I through the medium of pitman P and lever L, as shown in Fig. 2.

At the time the barb-wire is first fed forward between the strand-wires the coiling-pin is withdrawn and the barb is fed forward to lie against the face of cap C. As soon as the feed is complete the coiling-pin emerges and, in its rotation with the coiling-pinion G^5, catches the extending prod of the barb and coils it twice around the strand-wires, as shown in Figs. 14 and 21, the coil being made in the 732 direction toward the coiling-pinion, which is forced back by said coil as it is made. As soon as the coil is complete the cam D^2, through the medium of sleeve S, withdraws the coiling-pin within the cap C, free from the barb, and at the same instant one of the rotating cutters of the wheel G^3, in conjunction with stationary cutter A^2, severs the barb loose from the barb-wire W′ in a diagonal manner, to form the opposite prod of the barb, so that the barb will appear as shown in Fig. 21 when finished, and so that the next succeeding barb may be fed in across the face of the cap C, as stated. Said coiling-pinion is one-fourth the diameter of its drive-pinion G^4, and consequently rotates four times the speed of said drive-pinion for the purpose of rotating the coiler twice each time it coils on a barb. The wheel G^3 rotates one-half way around while the coiling-pinion rotates four times—twice while coiling the barb and twice while withdrawn—and a barb is fed in and completed at each half-rotation of wheel G^3, as it is provided with two oppositely-arranged cutters, a a', each of which severs a barb loose when they pass stationary cutter a^2.

The object of placing wheel G^3 eccentrically with the coiling pinion, as stated, is to cause its cutters to pass near the strand-wires at the time the barb is severed loose and leave the prod the proper

length, and so the opposite cutter on said wheel will be such a distance from the coiling-pinion as not to be in the way of the barb-wire when it is first fed in and before it is coiled on the strand-wires.

In Figs. 18 and 20 a variation of the construction of the strand-wire guide C′ is shown. In order to render it more easily made, the channels C^4 may be continued through its whole length. Its forward end may be diminished in size a little way back for the reception of the sleeve C^5 on its diminished part, as shown in Fig. 20, the said channels being deep enough so the wires can pass in them through said sleeve C^5, and the forward end, C^7, of said sleeve can pass through to the front side of cap C, as shown in Fig. 19, and said sleeve can have formed on it the annular flange S′ for holding in the coiling-pin, as in the other construction; but when the parts are all connected the device is mechanically the same in both cases, the only advantage gained being that the guide can be made without having to bore the holes connecting with said channels. In the construction of the barb-wire feed the outer end of the pitman P is forked, as shown at P′, Fig. 4, over a swivel-box, P^2, through which the end of lever L passes and slides, and the lower part of said box is provided with a slide which traverses in the guideway E, secured to the end of the machine-bed. Such construction prevents the outer end of the pitman from taking the curved motion of the lever L. The opposite end of said lever is provided with a guideway for the reception of a swivel-slide, L′, connected with the sliding head J. Such construction permits lever L to reciprocate sliding head J in a straight line.

The disk I on the end of shaft R has pivotally secured to its face the plate I′, by means of the screw V′, at its lower side, and screw V, passing through slot V^3 in disk I. The wrist-pin U is secured to the face of said plate I′. By moving said plate I′ from side to side at the top the wrist-pin may be placed and held at different distances from the center, and thus change the stroke of the feed. Figs. 2 and 5 show this construction. The butterfly-wheel Z^2 is journaled on the outer end of lever K, which is pivoted at its opposite end on stud Y of standard A^2, and passes under cam E′ on shaft R, as shown in Figs. 1 and 2. When cam E′ rotates it will oscillate said lever and butterfly-wheel Z^2 between the stationary butterfly-wheels Z Z′, for the purpose hereinafter stated.

S^9 is a coil-spring connecting said lever K with the floor, for the purpose of preventing said lever and butterfly-wheel from rising too quickly when the cam E′ rotates, and for yieldingly holding said butterfly-wheel Z^2 on the strand-wires and preventing them from becoming slack.

Q is a loose pulley, and Q′ is the drive-pulley, to which power is applied to drive the machine.

In operation the strand-wires W W are threaded through the guide C′ in its channels C^4, and from thence over the two butterfly-wheels Z Z′ and under oscillating butterfly-wheel Z^2 to the twister T. The barb-wire is intermittingly fed in, by the barb-wire-feeding mechanism described, diagonally under the cutting-edge of the stationary cutter A^3, and so its fed-in point will pass between the two strand-

wires far enough so its end fed in will be long enough to be coiled around the strand-wires the required number of times and leave a prod of sufficient length uncoiled. The coiling-pin *b* then emerges, and in its rotation around the strand-wires catches the barb-point fed in and coils it twice around the strand-wires in the direction toward the coiling-pinion, which is forced backward against the coil-spring S^6 at its opposite end by the barb as said coil is being made. At the instant the coil is finished the coiling-pin withdraws, and simultaneously one of the rotating barb-cutters, in conjunction with stationary cutter a^2, severs the barb in a diagonal manner loose from the barb-wire. The oscillating butterfly-wheel then moves downward between the other two butterfly-wheels and draws the strand-wires along far enough for the next barb to be placed on in like manner. When a barb is finished and moves on, the coiling-pinion is relieved from pressure of the barb and the spring behind it moves it forward and the coiling pin *b* reciprocates forward, by means of spring S^4, and emerges from the coiling-pinion after the next barb is fed in, and performs another like operation.

733 & 734 Having thus described my invention, what I claim as new, and desire to secure by letters patent, is as follows, to wit:

1. In a wire-barbing machine, in combination with a hollow wrapping-shaft having a barb-coiling pin and a stationary barb-cutter, rotating barb-cutters arranged eccentrically with said wrapping-shaft and said coiling-pin, substantially as and for the purpose set forth.

2. In the wire-barbing machine shown and described, the combination of the standard-box H, having the plate *h*, provided with stud *h'*, reciprocating coiling-pinion G^5, reciprocating sleeve S, having the annular flange S', reciprocating coiling-pin *b*, having the notch *b'*, wheel G^3, having the barb-cutters *a a'* and arranged on said stud eccentrically with said coiling-pinion, stationary barb-cutter *a'*, strand wire-guide C', having the channels C^4, and the means, substantially as specified, for operating said parts and for feeding said strand and barb wires, as and for the purpose set forth.

3. In a wire-barbing machine, the combination of a continuously rotating and reciprocating coiling-pinion and coiling-pin, a stationary barb-cutter, and a pair of oppositely-arranged rotating barb-cutters set to rotate eccentrically with said coiling-pinion and pin and to shear with said stationary cutter, substantially as and for the purpose set forth.

4. In the wire-barbing machine shown and described, and in combination with the reciprocating coiling-pinion G^5 and the cap C thereof, the reciprocating sleeve S', and the coiling-pin *b*, having the notch *b'*, for connecting said sleeve and pin, substantially as and for the purpose set forth.

5. In the wire-barbing machine shown and described, the combination of the coiling-pinion G^5, having the cap C, sleeve S, coiling-pin *b*, strand-wire guide C', stud D, friction-roller D', cam D', and spring S^4, substantially as and for the purpose set forth.

6. In the wire-barbing machine shown and described, the combi-

nation of the sleeve S, having the annular flange S′, and the coiling-pin *b*, having the notch *b*′, for connecting said pin and sleeve, so that said sleeve may reciprocate said pin, and said pin rotate around said sleeve, substantially as and for the purpose set forth.

7. In the wire-barbing machine shown and described, the combination of the gear-wheel G^4, pinion G^5, carrying coiling-pin *b*, gear-wheel G^2, and gear-wheel G^3, having the barb-cutters *a a*′ and stationary cutter a^2, as and for the purpose set forth.

8. In the wire-barbing machine shown and described, the combination of the sliding head J, provided with means for engaging the wire-guide N′, lever L, and swiveled slide L′, as and for the purpose set forth.

9. In the wire-barbing machine shown and described, and in combination with its barbing mechanism, the stationary butterfly-wheels Z and Z′, and butterfly-wheel Z^2, arranged between said stationary butterfly-wheels and adapted to oscillate, substantially as and for the purpose set forth.

10. In the wire-barbing machine shown and described, and in combination with shaft R, having pinions G^2 G^4, and cam D^2, the reciprocating coiling-pinion G^5, wheel G^3, having the barb-cutters *a a*′, reciprocating sleeve S, having the coiling-pin *b*, strand-wire guide C and stud D, provided with friction-wheel D′, cap C, box H, plate k, and stationary barb-cutter a^2, substantially as and for the purpose set forth.

11. In the wire-barbing machine shown and described and in combination with the wire-barbing mechanism described, the barb wire-feed mechanism consisting of the crank-disk I I′, pitman P, having the swivel-box P^2, guide E, lever L, sliding head J, having the pivoted slide L′, grip-dog *d* and grip-plate d^2, and guide N′, all arranged to operate as and for the purpose set forth.

12. In the wire-barbing machine shown and described, the combination of arm K, cam E′, spring S^3, and butterfly-wheels Z Z′, and Z^2, as and for the purpose set forth.

ALBERT J. BATES.

Witnesses:

THOS. H. HUTCHINS.
WM. J. HUTCHINS.

740 United States Patent Office.

JAMES M. SNYDER, of Springfield, Illinois.

Wire-fence-weaving Machine.

Specification forming part of Letters Patent No. 419,480, dated January 14, 1890. Application filed December 10, 1888. Serial No. 293,208. (No model.)

To all whom it may concern:

Be it known that I, James M. Snyder, a citizen of the United States, residing at Springfield, in the county of Sangamon and State of Illinois, have invented a new and useful improvement in wire-fence-weaving machines, of which the following is a specification.

My invention relates to wire-fence-weaving machines in which the straight tension-wires are woven together with an interlacing diagonal mesh-work of wire.

The object of my invention is the rapid and strong weaving of wire fences, in which all the wires in their composition are woven together into a firm body of net-work. I attain this object by means of the machine shown in the accompanying drawings, which are to be considered a part of this specification.

(Here follow diagrams marked pp. 735, 737 and 739.)

Figure 1 is a plan view of the machine. Fig. 2 is a longitudinal section. Fig. 3 is a detail of the shifting-shaft. Figs. 4 and 5 are transverse sections. Fig. 4½ is a detail, partly in elevation and partly in cross-section, of the clamp-operating device; and Fig. 6 is a detail of the shifting-shaft and spool.

The machine is constructed of a strong frame-work of wood, as indicated in the different drawings. The tension or anchor wires of which the fence is made are put on the reels, as shown at A A A. The wires *a a a* are then passed from the reels through the twisting-shafts *c c c* and to the roller B, on which the fence is rolled as woven. The shafts *c c c* are made of gas-pipe, (hollow,) so that the wires *a a a* may pass through and the shafts be revolved about without twisting them. Between each two of these shafts is placed a stationary sliding shaft, on which is bolted a spool or small reel of wire, as indicated at *d' d* on the drawings, and as shown in Fig. 6. From these spools *d d d* is supplied and woven the diagonal interlacing mesh-work between the tension-wires *a a a*. They are shifted to and from each of the twisting-shafts *c c c* alternately by means of the shifting-frames F F F. Two of these frames are used to shift *d' d d' d* back

17179

(No Model.) 3 Sheets—Sheet 1.

J. M. SNYDER.

WIRE FENCE WEAVING MACHINE.

No. 419,480. Patented Jan. 14, 1890.

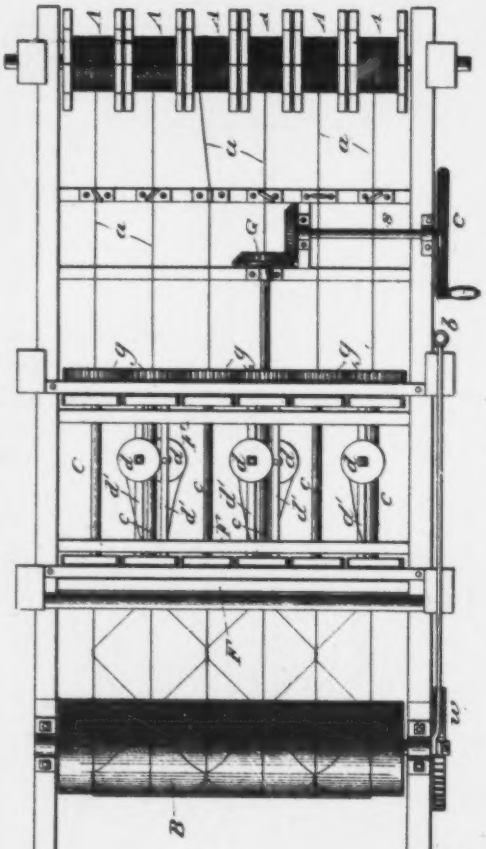


Fig. 1.

Witnesses:
S. A. Bullard
C. G. Bollee

Inventor:
Jas. M. Snyder
by
Geo. W. Bullard
Attorney

17180

(No Model.) 3 Sheets—Sheet 2.

J. M. SNYDER.

WIRE FENCE WEAVING MACHINE.

No. 419,480. Patented Jan. 14, 1890.

Fig. 2.

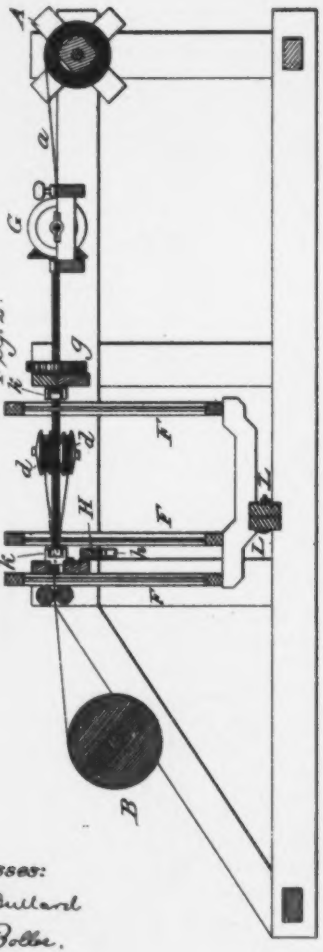
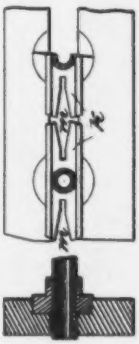


Fig. 3.



Witnesses:
S. A. Bullard
C. S. Bolles.

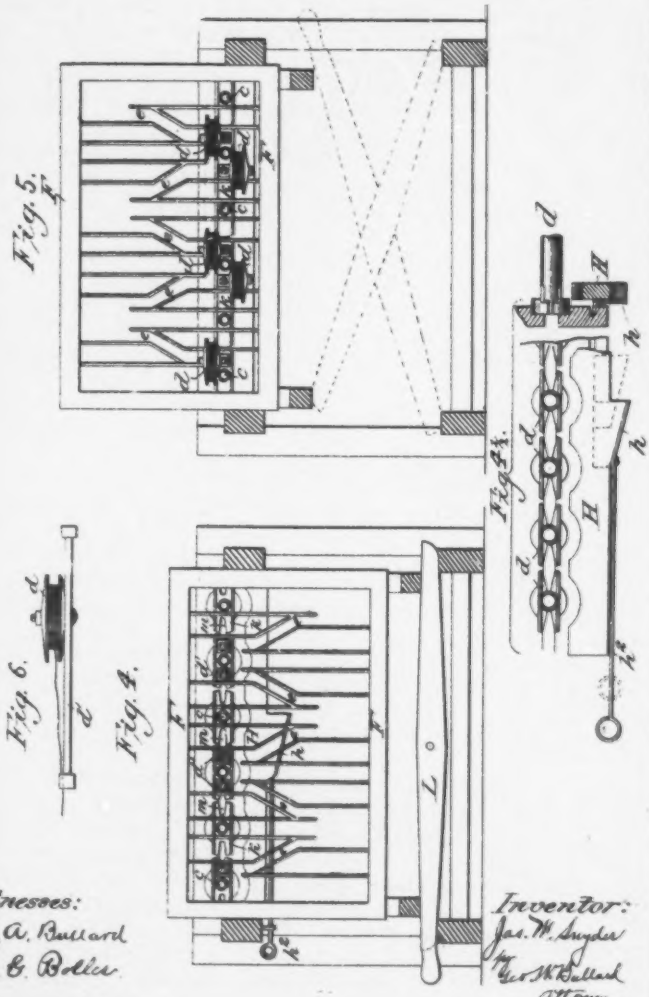
Inventor:
Jas. M. Snyder
By Chas. M. Bullard
attorney.

(No Model.) 3 Sheets—Sheet 3.

J. M. SNYDER.

WIRE FENCE WEAVING MACHINE.

No. 419,480. Patented Jan. 14, 1890.



Witnesses:
S. A. Ballard
E. B. Bolles

Inventor:
Jas. M. Snyder
by Geo. H. Ballard
Attorney.

and forth, while the third nearest the front end of the machine is used to hold the interlacing wires close to the tension-wires *a a a* while being twisted around them.

The construction and operation of the frames F F F are shown in the cross-sections, Figs. 4 and 5. In Fig. 1 the frames are down and the spools *d d d* are in the position therein shown, while Fig. 5 represents the frames F F F raised up, which, by means of the slides *e e e*, shifts *d' d* to the other twisting-shafts for the purpose of weaving the wires about them. The frames F F F are raised and lowered by means of the levers L L and the handle *l*, the weight of the frames being balanced by a counter-weight, cord, and pulleys when desired.

The machine is operated by the crank-wheel C, which, by means of the shaft *s*, turns the side gears G, one of which is on one of the shafts *c*. The shafts *c c c* are all geared together by means of cog-gearing *g g g* of equal size, making all turn evenly and regularly, one revolution of C causing one revolution of *c c c*. The meshwork is moved forward at each operation by means of the roller B, which is turned the desired distance by means of the ratchet-wheel *w* and lever *b*.

The machine is held from being operated by means of a clamp-bar H, which, by means of a slide incline *h* and handle h^2, is pressed up against the slide-guide of the twisting-shaft *c c c*. (Shown more plainly in Fig. 3 at *k*.) The clamp is also used to hold the guides in line, so that the shafts *d'* may be easily shifted back and forth. After turning the roll B forward the desired distance the shafts *d' d' d'*, with spools *d d d*, are shifted from the shafts *c c c* just woven upon to those to be woven on, the clamp H is lowered, and the wheel C turned any desired number of rounds, the clamp H again tightened and the roller B turned forward, and the shafts *d' d' d'*, with spools *d d d*, shifted back again to the former shafts *c c c*. The operation is thus continued until any desired length of fence is woven.

The spools *d d d* and the reels A A A can readily be removed and refilled when exhausted and the new wire connected with that in the woven work, making all strong and continuous for any desired length.

741 & 742 The slide-guides *k k* at the front end of the machine are made forked to allow the wires to come near the twisting-shafts and to twist them around the wires *a a a*. This is shown at *m m*, Fig. 3. The slide-guides are rigidly secured to the hollow shafts *c*.

A special merit of this machine may be mentioned, viz: By increasing the width and number of twisting-shafts a fence can be woven of any height composed of from two to any number of tension-wires *a a a*; also, as a matter of economy a number of the wires *a a a* may be left out of the upper part of the fence where they are not needed to guard against the approach of smaller animals.

I am aware that machines for weaving wire-fences and mesh-work have been used and patented previous to my invention. I therefore do not claim my invention, broadly; but

What I do claim as new and useful, and desire to secure by letters patent, is—

1. The combination, in a wire-fence-weaving machine, of the hollow twisting-shafts *c c c*, with gearings *g g g*, the shifting shafts *d'* and spools *d*, and frames F F F, operated by the levers L L and *l*, the clamp H, the roller B, the reels A A A, and crank-wheel C, all substantially as described, and for the purposes set forth.

2. The combination, in a wire-fence-weaving machine, of the twisting hollow shafts *c c c*, with the forked slide-guides *k k*, and the shifting-shafts *d' d' d'* and spools *d d d*, substantially as described and set forth.

JAMES M. SNYDER.

Witnesses:

S. A. BULLARD.
HUGH GEARTY.

(No Model.) 2 Sheets—Sheet 1.

E. S. MORGAN.

WIRE FENCE MACHINE.

No. 432,951. Patented July 22, 1890.

Fig. 1.

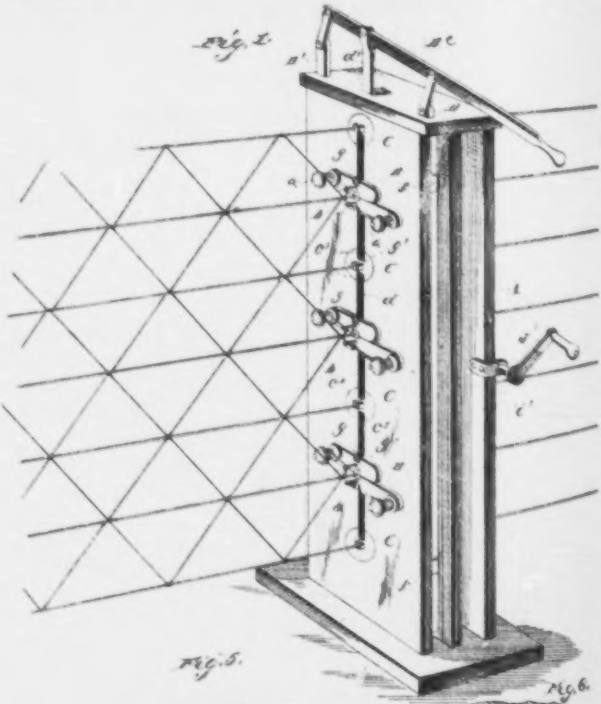


Fig. 5.

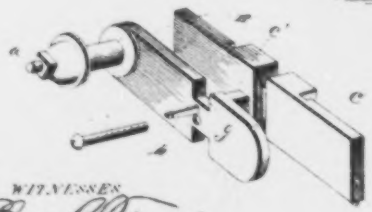
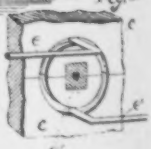


Fig. 6.



WITNESSES

Chas. L. Taylor,

Phil. Cabasi

INVENTOR

E. S. Morgan

by Chas. Anderson.

his Attorney

(No Model.) 2 Sheets—Sheet 1.

E. S. MORGAN.

WIRE FENCE MACHINE.

No. 432,951. Patented July 22, 1890.

Fig. 2.

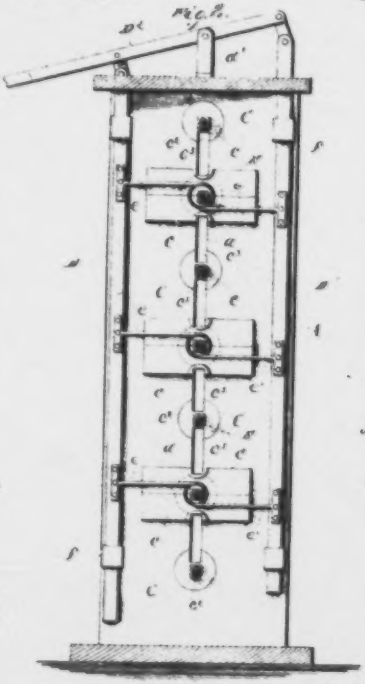


Fig. 3.

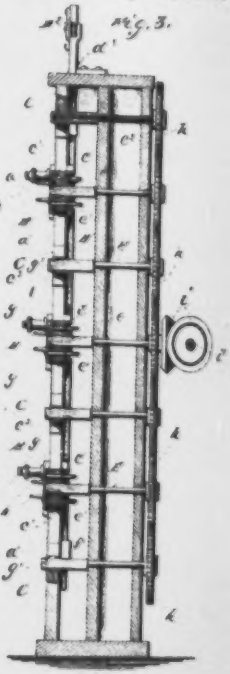
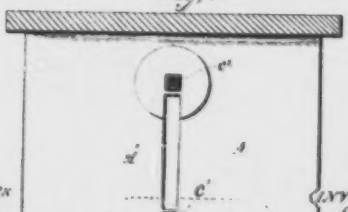


Fig. 4.



WITNESSES

Chas. L. Wagner,

Phil. C. Masi.

INVENTOR

E. S. Morgan

by E. W. Anderson

his Attorney

746

United States Patent Office.

EDWARD S. MORGAN, of Dublin, assignor of one-half to James McNeill and Silas O. Leeson, of Richmond, Indiana.

Wire-fence Machine.

Specification forming part of Letters Patent No. 432,951, dated July 22, 1890. Application filed April 1, 1890. Serial No. 346,202. (No model.)

To all whom it may concern:

Be it known that I, Edward S. Morgan, a citizen of the United States, residing at Dublin, in the county of Wayne and State of Indiana, have invented certain new and useful improvements in wire-fence machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

(Here follow diagrams marked pp. 743 & 745.)

Figure 1 of the drawings is a perspective view. Fig. 2 is a vertical transverse section. Fig. 3 is a vertical longitudinal section. Fig. 4 is a sectional detail, and Fig. 5 is a perspective detail view. Fig. 6 is a broken detail perspective view more fully disclosing the construction of the bent pitman *e'*, as also portions of the carriages and shaft.

This invention relates to certain improvements in fence machines; and it consists of the novel construction and combination of parts, as will appear from the following description and accompanying drawings.

In the drawings, A refers to a suitable upright support, upon which is arranged the operative mechanism.

B B are series of carriages or reels, each series consisting of two carriages provided with spindles *a a*, carrying spools of wire, and with needles *b*, through which the wire is passed, those of a series being arranged opposite to each other and only a short distance apart. Each carriage B is connected to a plate or bracket *c*, arranged upon the inside of the support A by means of a cross-piece *c'*, passing through a slot *d*, extending almost the entire length or height of the support.

In the slot d, at equal intervals apart corresponding to the distances the horizontal wires or stringers are arranged apart, are secured disks or plates C, which are each provided with a central aperture c^2 for the passage of the shaft therethrough. These disks or plates are also each provided with notches or recesses c^3, one arranged in its upper edge and one in its lower edge, to receive and limit the movement of the cross-piece c' of each carriage. The brackets or plates c are connected, the upper ones to a slide D by a bent pitman e and the lower ones to a similar slide D' by similar pitman e', said slides being arranged and guided in their movements by keepers or staples f, secured to the supports A.

The carriages of each series are provided at their meeting edges with recesses or notches g, which receive and embrace the rectangular portions g' of the shafts E, passing through the slot d in the support A. These shafts E are driven by intergearing pinions h, mounted thereon and driven by beveled gear-wheels i, geared together, one of said wheels being mounted or secured on the shaft of one of said pinions and the other secured on a shaft i', suitably journaled on the support A and having a handle j'. The shafts F are hollow or tubular to permit the passage therethrough of the horizontal wires or stringers of the fence, around or upon which the crossing-wires of the fence are woven, as presently seen. The slides D D' are connected together by a handled lever D, fulcrumed upon a bar d', secured upon the support A.

In operation it will be seen that the machine being in position upon the horizontal wires or stringers, as shown in Fig. 1, and it is desired to continue the diamond-like weaving of the crossing-wires or web portion, the same as shown at the left of the machine, the handle of the lever D^2 is depressed, which will throw each series of two carriages to the next horizontal wires. Before this, however, the machine is moved bodily the requisite interval along said horizontal wires. The handle of the driving-shaft of the gearing is now grasped and turned, which will revolve the carriages and cause the coiling of the wires carried by the spools on said carriages around the horizontal wires, and thus effect the weaving of the wires, as aforesaid. By again moving the machine and reversing the movement of the lever shifting the position of the carriages, the aforesaid operation of weaving the wires is repeated, and in this manner the fence is woven throughout.

Having described this invention, what I claim is—

747 & 748 1. In a fence machine, the carriages carrying wire-holding spools and needles, in combination with intergeared shafts, each engaging a pair of carriages and driven by suitable gearing, and means for shifting said carriages from one point to another and alternately into engagement with the adjacent pairs of shafts, substantially as set forth.

2. In a fence machine, the carriages or reels carrying wire-holding spools and needles, oppositely-movable slides connected together by a handle-lever, the bent pitmen connecting together said carriages or reels and said slides, the support having a longitudinal slot, along or in which are arranged at intervals disks or plates provided with

central apertures and in their opposite edges with notches or recesses, and the hollow shafts engaging opposite reels or carriages of a series and bearing intergearing pinions suitably driven, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

EDWARD S. MORGAN.

Witnesses:

THOMAS C. MOORE.
HERBERT L. MORGAN.

754 United States Patent Office.

WILLIE D. WHITNEY, of Clarendon, New York.

Wire-fabric Machine.

Specification forming part of Letters Patent No. 484,528, dated October 18, 1892. Application filed April 5, 1892. Serial No. 427,849. (No model.)

To all whom it may concern:

Be it known that I, Willie D. Whitney, of Clarendon, in the county of Orleans and State of New York, have invented a certain new and useful improvement in wire-fabric machines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the drawings accompanying this specification.

My improvement relates to that class of wire-weaving machines in which rotating twisters are used for connecting the filling-wires with the longitudinal strands. In such machines the twisters have a degree of transverse movement equal to the distance apart of the longitudinal wires in order to produce the filling. In ordinary machines of the kind each twister is made of three parts—a center section, through which the longitudinal wire runs, and two side sections, which carry the filling-wires. All three of these parts revolve, and the revolution of the center section gives motion to the side sections. Such devices are necessarily complex and expensive.

It is the object of my invention to simplify the apparatus by dispensing with the central section of the twister and to use only the two side sections, or those which carry the filling-wires, and to do this I have produced a novel connection between the said side sections and the gears by which they are driven, so that as said side sections are alternately thrown up and down to cross from one longitudinal wire to another, as is done in all machines of this class, proper revolving motion will be given to each section without the interposition of other parts.

The invention consists in the construction and arrangement of parts hereinafter described and claimed.

(Here follow diagrams marked pp. 749, 751 & 753.)

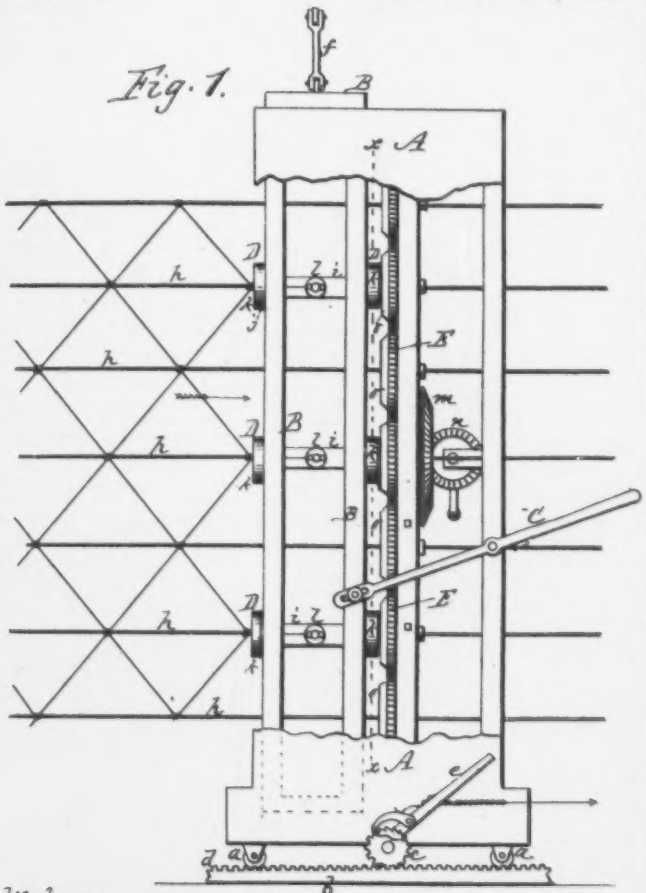
(No Model.) 3 Sheets—Sheet 1.

W. D. WHITNEY.

WIRE FABRIC MACHINE.

No. 484,528. Patented Oct. 18, 1892.

Fig. 1.



Witnesses.
F. B. Hutchinson
Chas. Seidenen

Inventor.
Willie D. Whitney,
per R. F. Osgood
Atty.

(No Model.) 3 Sheets—Sheet 2.

W. D. WHITNEY.

WIRE FABRIC MACHINE.

No. 484,528. Patented Oct. 18, 1892.

Fig. 2.

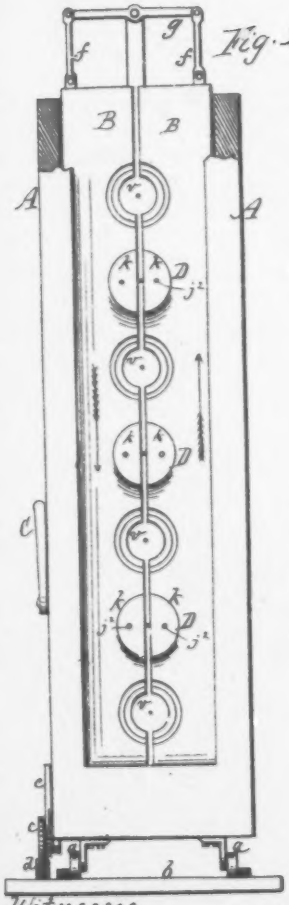
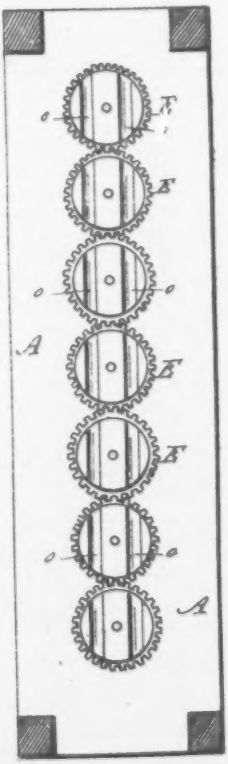


Fig. 3.



Witnesses.
Chas. Dickerson.
F. B. Hutchinson

Inventor
Willis D. Whitney.
per R. F. Osgood,
Atty.

(No Model.) 3 Sheets—Sheet 3.

W. D. WHITNEY.

WIRE FABRIC MACHINE.

No. 484,528. Patented Oct. 18, 1892.

Fig. 4.

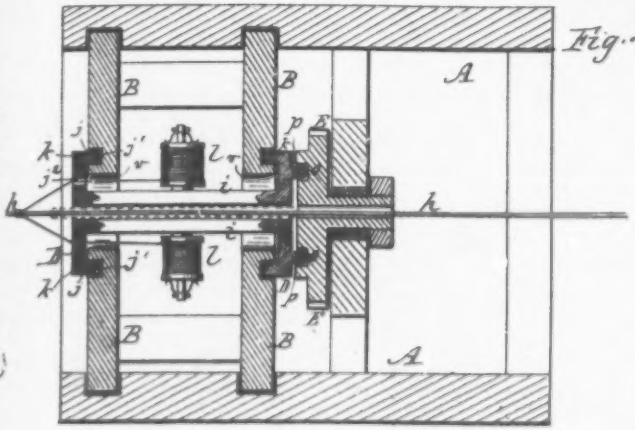
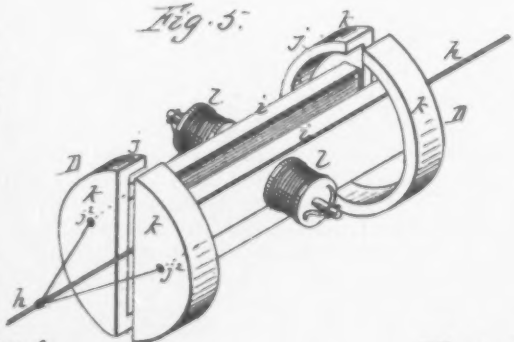


Fig. 5.



Witnesses.
F. B. Hutchinson
Chas. H. Seidemer.

Inventor.
Willie D. Whitney.
per R. F. Osgood
Atty.

In the drawings, figure 1 is a side elevation of the machine as adapted to the building of wire fence in the field. Fig. 2 is a front elevation of the same, looking in the direction of the arrow, Fig. 1. Fig. 3 is a vertical cross-section in line *x x* of Fig. 1 and showing the gears that give motion to the twisters. Fig. 4 is an enlarged horizontal section through one set of the twisters and the slides that support it. Fig. 5 is an enlarged perspective view of one of the twisters.

A indicates the frame of the machine, which may be either stationary or portable. In the latter case, and as shown in the drawings, it is provided with rollers *a a*, which roll on a plank or other track *b*, and is fed forward as fast as the fence is woven by means of a gear *c*, attached to the frame, which engages with a cog-rack *d* of the track. The gear is operated by means of a lever *e*, provided with a pawl that engages with a ratchet on the hub of the wheel. These devices are similar to others now in use.

B B are two slides, which work up and down vertically in ways in the frame A. At the top these slides are connected by links *f f* and a rock-arm *g*, pivoted centrally to some stationary part of the frame, by which means the reciprocations of the slides are in reverse directions—that is, when one slide moves up the other moves down, and *vice versa*. On one side one slide is operated by a hand-lever C, which plays between stops to gage the exact throw of the slides.

D D are the twisters, of which any desired number may be used, varying with the number of longitudinal strands in the fence. Each of these twisters consists of two side sections D D, which are entirely independent of each other and are located apart a distance only sufficient to allow the longitudinal strands *h h* to pass freely through between them. Each of these sections consists of a bar *i* and two heads *k k*, one at each end, each head constituting only a segment of a circle. This is clearly shown in Fig. 5. To seat the heads and retain them in place and allow them to turn to twist the wires, the back of each head has a concentric rib *j*, Fig. 4, which fits in a corresponding concentric groove *j'* of the slide. By this means the sections forming the twister can rotate without being displaced and without closing together. Each of the bars *i* has a spool *l* of the filling-wire, and the loose end of the wire passes through a hole *j²* in the head, as usual in this class of machines. The rotation of the twister twists this wire onto the longitudinal strands. Half-circular openings *v v* are made in the slides B B opposite the heads to allow rotation of the sections and *and* passage of filling wires.

E E E are the gears by which the twisters are operated. They correspond in number with the number of longitudinal strands in the fence, and are located in line therewith. They have short tubular axles or bearings, through which the longitudinal wires pass freely. All these gears are of the same size and engage together, so that when one is rotated they are all rotated to the same degree. On the axle of one of these gears is an external bevel-gear *m*, with which engages a bevel-pinion *n*, provided with a crank, by turning which motion is imparted to the whole set of gearing. On the inner side each of these gears is provided with two parallel grooves or ways *o o*, Fig. 3, in which rest

755 & 756

corresponding parallel ribs *p p* on the backs of the inner heads *k k* of the twister-sections.

The operation is as follows: The ends of the filling-wires after passing through the twister-heads are attached to the longitudinal wires and the twisters are then rotated to wind them in place. When this is done, the machine is moved forward a distance equal to the length of the mesh to be made. The lever C is then operated, which throws one slide B up and the other one down, thereby bringing one twister-section in line with the longitudinal wire above and the other with that one below, but leaving each in company with another twister-section. This crosses the filling-wires from one longitudinal wire to another. Another twist is then given, the machine is again moved forward, and the slides again reversed, which brings the twisters back to their original position and ready to make a new twist. Each upward and downward movement of the slides carries the twister-sections with them, and the ribs *p p* on the back of the twister-heads pass into the grooves or ways *o o* from one gear to another. The movements of the gears are so timed that their grooves come into position to receive the ribs at the end of the throw of the slides. By the connection of the heads of the twister-sections directly with the gears, as just described, I am enabled to dispense with a central revolving section to each twister, which in ordinary machines of the kind rests between the two side sections, and is used to revolve the same. I thus greatly simplify the machine and make it more perfect in use.

I am aware that in some machines guides similar to the grooves or ways *o* have been used, not in the gear-wheels, but on the ends of shafts; but in such case double guides have to be employed at some distance apart, and the twisters consist of bars which are moved up into these guides by a cam-frame. My device is much simpler and more easily operated and less liable to get out of order. Under ordinary circumstances the longitudinal wires have sufficient tension to allow the twisting of the filling-wires without trouble, but if desired a fixed tube or bearing may be extended between the slides to a point near the place where the twisting occurs, as indicated by the dotted lines, Fig. 4.

As shown in the drawings, the machine is used in the field for making wire fence where the longitudinal wires are already stretched; but the invention can be as readily applied in a stationary machine for weaving wire fabric.

Having described my invention, I disclaim the broad feature of reversible slides and sectional rotating twisters connected therewith. I also disclaim the broad feature of transferring the sectional twisters from one guideway to another.

What I claim as new, and desire to secure by letters patent, is—

1. In a wire-fabric machine, the combination of reversible slides, a set of sectional side twisters connected with each slide by means of concentric ribs on twisters and grooves in the slides, a set of intermeshing gears corresponding in number and position with the longitudinal wires, a set of grooves or ways in each of said gears, and a corresponding set of ribs on each twister, whereby the power is

applied directly to one end of the side twisters, the twisters being adapted to be transferred from one gear to another with the reversal of the slides, substantially as set forth.

2. The combination, with the sectional side twisters D, provided with double heads *k k*, the slides B, and mechanism for reciprocally moving said slides in opposite directions, of the concentric ribs *j j*, formed on the heads, and the corresponding concentric grooves *j' j'*, formed in the slides, whereby the side twisters are held in the slides in position to be turned by the gears, substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

W. D. WHITNEY.

Witnesses:

R. F. OSGOOD.
CHAS. R. OSGOOD.

760 United States Patent Office.

WILLIE D. WHITNEY, of Clarendon, New York.

Wire-fence Machine.

Specification forming part of Letters Patent No. 505,890, dated October 3, 1893. Application filed April 14, 1893. Serial No. 470,342. (No model.)

To all whom it may concern:

Be it known that I, Willie D. Whitney, of Clarendon, in the county of Orleans and State of New York, have invented a certain new and useful improvement in wire-fence machines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the drawings accompanying this application.

My improvement relates to machines for making a wire fence in the field.

It also relates to that class in which the twister heads are alternately moved from one gear to another by means of alternately moving slides.

The invention consists in the construction hereinafter described and claimed.

(Here follow diagrams marked pp. 757 & 759.)

In the drawings figure 1 is a side elevation of the machine. Fig. 2 is a front elevation looking at right angles to Fig. 1. Fig. 3 is an enlarged cross-section of the same on line *x x* of Fig. 2. Fig. 4 is an enlarged elevation of one of the gear wheels, two of the segmental twister heads connected therewith, and a portion of one of the operating slides.

A indicates the support, consisting of an upright wooden post, to which are attached the operating parts.

B B B are a set of spur gears attached to said support and intermeshing, as shown. One of these gears has a bevel cog rim C, with which engages a bevel gear B′ operated by a hand crank D. By this means all the gears have a simultaneous and equal rotation.

E E E are a set of hollow spindles fixed in the support A, through which spindles the longitudinal wires *a a* of the fence pass, and on which the gear wheels turn freely. For convenience of attachment and disconnection said spindles are preferably made each in two parts screwed together, and that part which enters the support also screws into a separate tube driven tightly into the support. This is

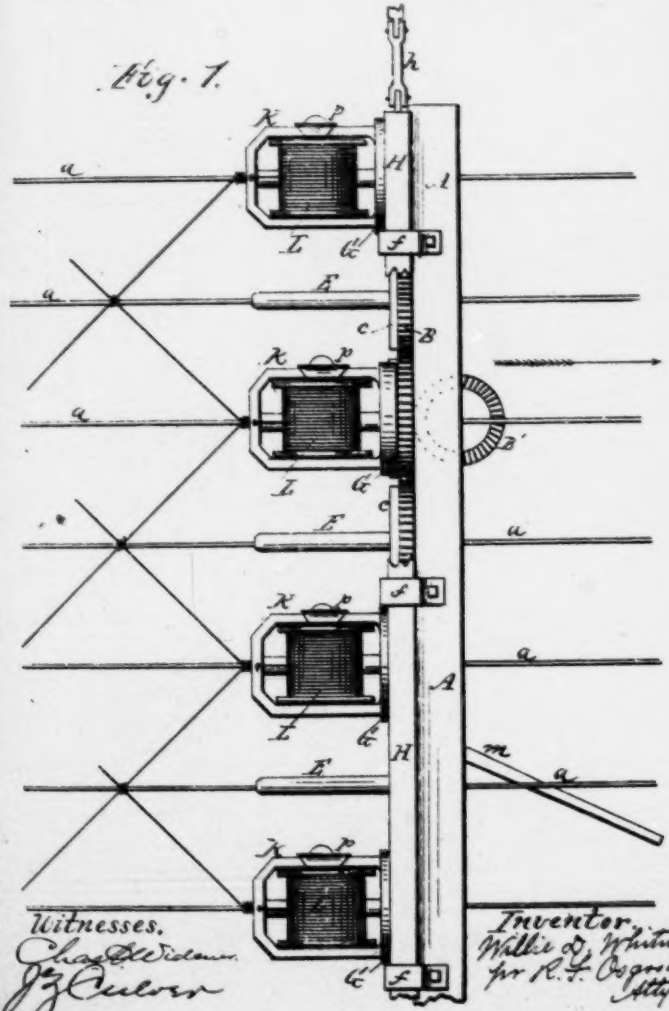
(No Model.) 2 Sheets—Sheet 1.

W. D. WHITNEY.

WIRE FENCE MACHINE.

No. 505,890. Patented Oct. 3, 1893.

Fig. 1.



Witnesses.
Chas. E. Wilson
J. Z. Culver

Inventor.
Willis D. Whitney
per R. F. Osgood.
Atty.

(No Model.) 2 Sheets—Sheet 2.

W. D. WHITNEY.

WIRE FENCE MACHINE.

No. 505,890. Patented Oct. 3, 1893.

Fig. 2.

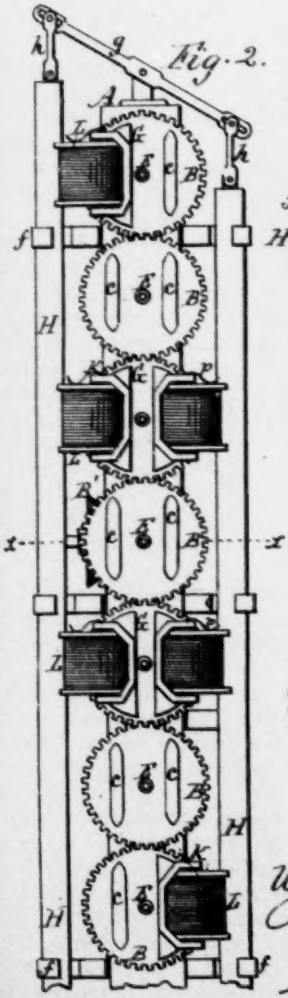


Fig. 3.

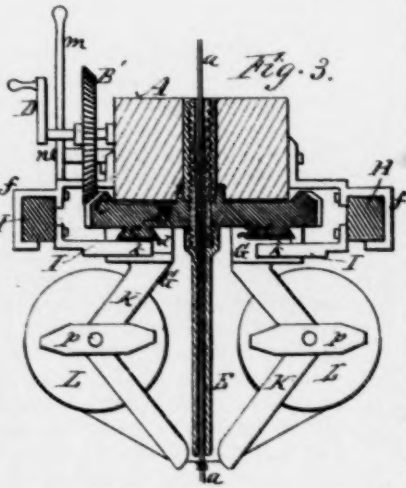
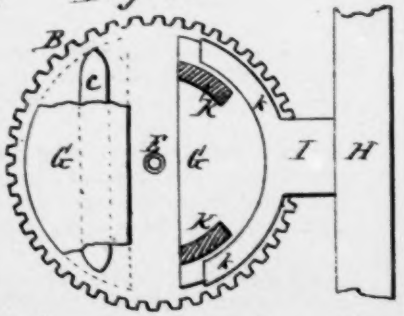


Fig. 4.



Witnesses.
Chas. F. Merriam
S. S. Hutchinson

Inventor.
Willis D. Whitney
by R. F. Osgood.
Atty.

clearly shown in the cross section, Fig. 3. By this means the gears and connecting parts can be readly removed from place.

G G are the twister heads, consisting of segmental heads sliding up and down on the faces of the gears, and shifting position from one gear to another. These twisters are used in pairs, except at the top and bottom where only a single twister is used as shown in Fig. 2. The pairs also alternate with the gears as shown, so that when engaged with one gear the next one is free. The twisters are connected with the faces of the gears by means of dovetailed ribs *c c* on the faces of the gears and corresponding dovetailed slots *d d* in the twisters. By this means the twisters are held firmly in place and there is no tendency to separate by reason of the great strain that occurs in the twisting of the wires. The ends of the ribs *c c* are rounded or made pointed to facilitate the sliding of the twisters from one gear to another.

H H are the slides by which the twisters are operated. They consist of two upright strips of wood mounted in bearings *f f* attached fast to the support A, and moving freely up and down in said bearings. At the top they are connected with a rock arm *g* and connecting rods *h h*, so that a reverse action takes place, one slide moving down as the other moves up.

I I are bearings attached to the slides, said bearings extending inward and having segmental heads *k k* which embrace the outer segmental edges of the twister heads. By this means they hold the twisters and cause them to move up and down with the movement of the slides so as to be changed from one gear wheel to another, and they also allow the necessary rotary movement of the twisters to twist the wires. The segmental or circular form of the twister heads is a necessity to allow this action to take place. The slides are operated by means of a lever *m*, pivoted at one end to one of the slides and having its fulcrum at *n*, on a bearing of the machine.

K K are V-shaped brackets forming a part of the twister heads, the same projecting outward as shown in the plan view Fig. 3, their outer ends converging close to the spindle through which the fence wire passes.

L L are the bobbins of filling wires pivoted in these brackets. The ends of the filling wires pass through holes in the ends of the brackets and are there twisted onto the main wires of the fence. Tension is applied by means of flat springs *p p* which bear on the spools as shown.

It will be seen that the two twister heads, being of segment form so as to turn freely in the bearings that connect them with the slides are embraced and held in said bearings so that the slides cannot be raised or lowered without carrying the twister heads with them. Hence at every movement of the slides the twister heads are changed from one gear to another, after which two or three rotations twist the wires sufficiently, and then another change is made carrying the twister heads back again. In this respect the action is similar to that in other machines of the kind. But it is a peculiarity in this invention that the twister

761 & 762

heads are flat disks resting in close contact with the face of the gears, and are not extended forward away from the gears as in other machines, and also that in this invention such flat segmental twister heads are held in close contact with the face of the gears by the dovetail connections, whereby they can resist the strong lateral strain produced in twisting, without being drawn out of place.

Having described my invention, what I claim as new, and desire to secure by letters patent, is—

1. The combination, with the gear wheels, of the flat segmental twister heads resting in close contact with the faces of the gears and connected therewith by dovetailed connections that allow said twister heads to shift from one gear to another by sliding along the dovetails, as herein shown and described.

2. The combination of a set of flat-faced gear wheels, a set of flat segmental twister heads resting in close contact therewith and connected thereto by dovetailed ribs, a set of brackets connected therewith holding the spools of filling wire, a pair of slides arranged to move in reverse directions, and bearings of the slides embracing the segmental heads, as shown and described and for the purpose specified.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

W. D. WHITNEY.

Witnesses:

R. F. OSGOOD.
A. W. WILBUR.

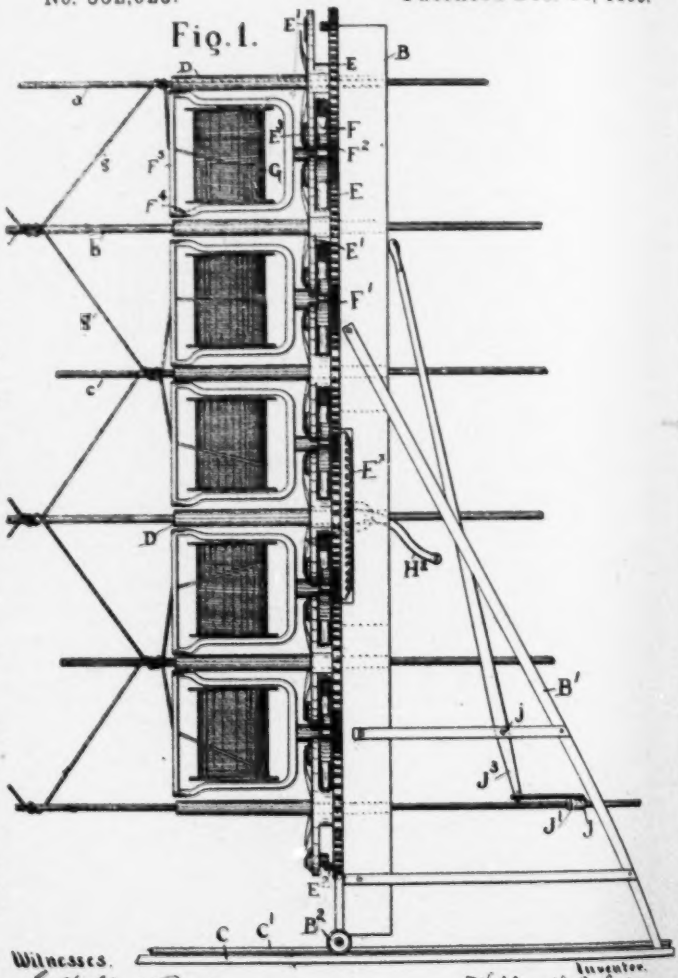
(No Model.) 3 Sheets—Sheet 1.

W. D. WHITNEY.

WIRE FABRIC MACHINE.

No. 552,025. Patented Dec. 24, 1895.

Fig. 1.



Witnesses.
G. Hilliard Rich.
G. A. Roder.

Inventor.
Willis D. Whitney
by Munn & Co
his Attys

Norfolk Hosiery Co. v. Whitney, p. 763

(No Model.) 3 Sheets—Sheet 1.

W. D. WHITNEY.

WIRE FABRIC MACHINE.

No. 552,025. Patented Dec. 24, 1895.

Fig. 2.

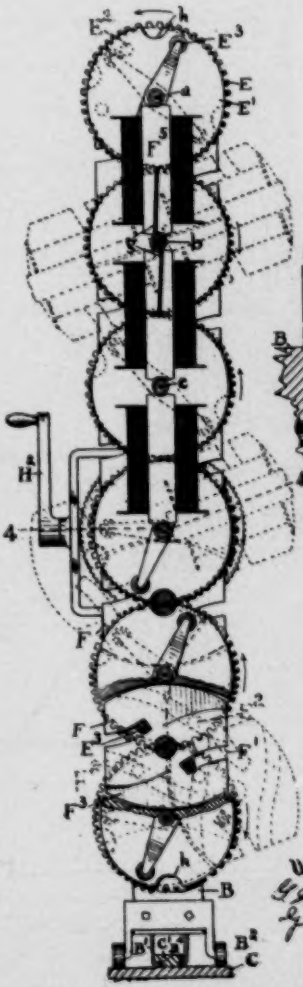


Fig. 5.

Fig. 3.

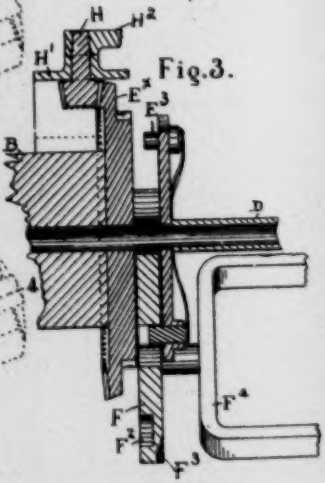
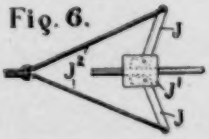


Fig. 6.



Witnesses.
G. Willard Rose.
Jas. A. Rose

Inventor.
Willis D. Whitney
by Church & Church
his Attys

Mo. Hdp.—Attorneys—Whitney—Wire Fabric Machine—No. 552,025

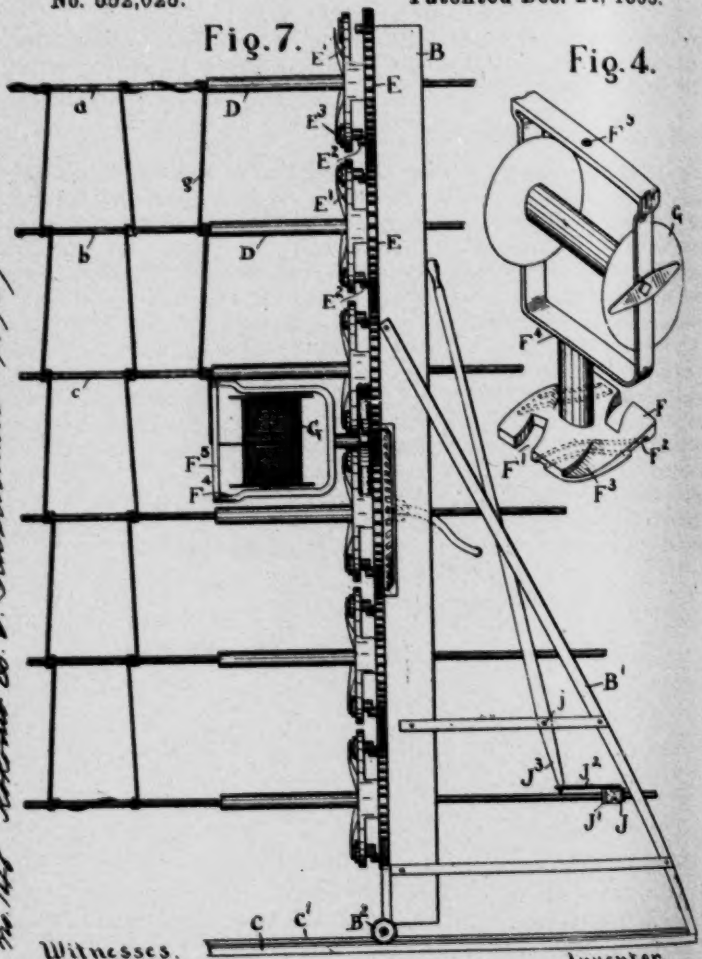
(No Model.) 3 Sheets—Sheet 3.

W. D. WHITNEY.

WIRE FABRIC MACHINE.

No. 552,025. Patented Dec. 24, 1895.

Fig. 7.


a
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D
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E
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768

United States Patent Office.

WILLIE D. WHITNEY, of Clarendon, New York.

Wire-fabric Machine.

Specification forming part of Letters Patent No. 552,025, dated December 24, 1895. Application filed September 12, 1895. Serial No. 562,342. (No model.)

To all whom it may concern:

Be it known that I, Willie D. Whitney, of Clarendon, in the county of Orleans and State of New York, have invented certain new and useful improvements in wire-fabric machines; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the reference letters and numerals marked thereon.

My present invention relates to machines for making that class of wire fabric used particularly for fencing, consisting of wires twisted about each other, and, if desired, about longitudinal wires, forming a netting; and it has for its object to provide a greatly-simplified machine in which the transfer of the spool-carriers, sometimes called "twisters," from one plane to another is accomplished automatically; and to these and other ends the invention consists in certain improvements hereinafter fully described, the novel features being pointed out in the claims at the end of this specification.

(Here follow diagrams marked pp. 763, 765 & 767.)

In the drawings, figure 1 is a side view of a machine constructed in accordance with my invention for making fencing in the field; Fig. 2, a front view of the same, partly in section, showing a second position of the parts in dotted lines; Fig. 3, a cross-sectional view on the line 4 4 of Fig. 2 with the parts in the position shown in dotted lines; Fig. 4, a perspective view of the spool-carrier; Fig. 5, a bottom plan view of one of the spool-carriers; Fig. 6, a plan view of the device for moving the machine; Fig. 7, a side elevation of the machine arranged for making square-mesh fencing.

Similar reference letters and numerals in the several figures indicate similar parts.

In the present embodiment of my invention I have shown it applied to a traveling frame adapted for making, in the field, fencing having longitudinal strands or wires, said frame embodying an upright post B having suitable braces B′, and at its lower end supporting-wheels B^2, resting upon a board or support C having a rib C′ grooved on opposite sides, into which grooves project the inwardly-extending ends B^4 of the braces B′. Passing through the post B, and at even distances apart, are tubes D, preferably extending at the front, as shown, and through these pass the longitudinal wires *a b c*, &c., of the fence or fabric, and upon them are loosely journaled rotary supports for the spool-carriers, said supports consisting, in the present instance, of intermeshing gears E having, at the front, plates E′, between which and the gears are recesses for the accommodation of the bottom plates F of the spool-carriers.

E^2 indicate studs or bosses arranged in the recesses and projecting from the face of the gear, and E^3 are latch-pins passing into the recesses through apertures in the plates E′ and pressed inward by springs E^4, small heads on the latch-pins limiting their inward movement. The studs and latch-pins are arranged some distance apart, as shown, the former being arranged to co-operate with the curved grooves F^2 in the rear side of the plate F of the spool-carrier, and the latch-pins to co-operate with the incline F^3 on the top of said plate, and the curved slot F′ in one side thereof, the groove and slot crossing, as shown, and the relations of the parts being such that the spool-carrier is held by the latch and stud on the rotary support and may be rotated with it without danger of dropping out.

Upon the outer sides of the plates F are the spools G containing the weft or filling wire *g* and mounted on a spindle in a suitable yoke-frame F^4 having the perforated cross-bar F^5 through which the weft-wire passes, any suitable brake or tension device being applied to the spool to prevent movement excepting when the wire is positively drawn off. The outer plates E′ of the rotary supports are preferably recessed at *h* for the accommodation of the standard of the spool-carrier, as shown in Fig. 2.

The gears E intermesh and are adapted to be rotated in either direction by means of bevel-pinion H mounted on a frame H′ and having an attached handle or crank H^2, said pinion meshing with a corresponding bevel-wheel E^5 formed upon or attached to one of the gears E, as shown in Fig. 3.

The devices for moving the frame B after the wires are twisted

consist of a clamp embodying jaws or levers J J, pivoted to a
769 block or support J′ and adapted to grip one of the longitudinal wires of the fence or fabric, the outer ends of said jaws being connected by links J^2 with the end of a lever J^3 pivoted to the main frame at *j*. It will be seen that when the lever is moved in the direction indicated by the arrow in Fig. 1 the jaws J J will grip the wire and the machine will be moved, and upon moving the lever in the opposite direction the jaws will slip on the wire, the distance of movement of the frame depending on the movement of the lever, which is adjusted to the size of the mesh required.

When making wire fabric or fence such as shown in Fig. 1, the longitudinal wires are first set up and held taut, being passed through the tubular supports D. Then the filling-wires *g* from the spools are secured to the end post or the longitudinal wires by twisting or in any suitable manner. For the purposes of illustration I will number the supports E from the top, calling the upper one 1, the next 2, and so on, and the upper longitudinal wire *a*, and the next *b*, and so on. Starting from the position shown in Fig. 2, in which the slots and grooves in the spool-carriers are engaged by the pins and studs on the supports E, the machine may be operated to twist the filling-wires together and around the wires *a c e* or *b d f*, as desired; but, assuming that the first twist is to be around the wires *b d f*, the supports E are rotated by the handle in the direction of the arrows, Fig. 2, and those numbered 2 4 6 will carry the spool-carriers F around as in dotted lines, their latches E^3 co-operating with the sides of the slots F′ and the studs E^2 preventing the carriers dropping out. This operation is accomplished because the slots F′ in the spool-carrier plates F extend transversely of the path described by the latch-pins on the supports 2, 4 and 6 that are to move the spool-carriers, and substantially coincident with the path described by the latch-pins on the supports 1, 3 and 5 that are to rotate empty, the grooves F^4 being correspondingly arranged relative to the studs E^2 on the supports. This rotary movement is continued in the same direction as long as may be necessary to form the required number of twists around the wires *b*, *d* and *f*, (the weft or filling wires passing around the longitudinal wires *b* and *d* being of course twisted around each other also, while a single weft-wire is passing around wire *f*.) During the movement in this direction, as the carriers approach the position shown in full lines in Fig. 2, the latches E^3 on the supports indicated by 1, 3 and 5 ride up the inclines F^3 on the plate F of the spool-carriers and drop into the slots F′, and as long as the motion is in the direction indicated the carriers will be rotated as described and maintained in the supports indicated by 2, 4 and 6; but when it is desired to twist the weft-wires around the longitudinal wires *a c e* it is only necessary to reverse the direction of movement of the supports E after said supports have completed a full revolution, after the latches have dropped into the slots F′, and when the parts are in the position shown in Fig. 2 in full lines, and the operation of twisting the weft-wires around wires *a c e* may be understood by assuming that the supports E are rotated in the opposite direction from that indicated by the arrows. Now, as before,

the latch-pins E^3 of the supports 1, 3 and 5, that are to move the spool-carriers, describe a path transversely of the plane of the slots F' in the carriers, and consequently move the carriers with them, while the latches E^3 on the supports 2, 4 and 6 ride up the inclines on the moving carriers, drop into the slots F' and pass out as the carriers turn away from the supports. It will now be understood that the weaving of the fence can be readily accomplished by making the required number of twists around the longitudinal wires and then reversing the operating means, transferring the spool-carriers and twisting on the other wires in the opposite direction, thus dispensing with the transferring mechanisms heretofore deemed necessary and simplifying and lightening the machine.

While the present embodiment of my invention is designed for building fences in the field, I do not wish to be confined to this arrangement, as wire netting or fabric could be readily made in quantity on large machines built for the purpose, the necessary relative movement of the fabric and machine being accomplished by moving the fence fabric instead of the machine, as herein.

Although the spool-carriers are supported only at the lower end and at some distance from the spools themselves, it will be noted that the wires *g* draw from the aperture in the cross-piece F' to the longitudinal strand, in the direction of the length of said cross-piece, and that while the carriers are being transferred and are rotating the end of the cross-piece is against and turns about the tubular extensions D, as seen in Figs. 1 and 2, thereby preventing the carriers from dropping out.

If it is desired to make a fence with square or rectangular meshes as shown in Fig. 7, it may be accomplished by this machine by removing all of the spool-carriers excepting one, and causing the supports E to make one (or more) and a half complete turns around each longitudinal wire before the motion is reversed, causing the carrier to travel down. Then move the frame back, twisting the wire around the lower wire *f*, as shown, and when the carrier has made one or more complete turns, reverse the motion and it will be transferred to the next support E above, if the motion is reversed when the carrier is in engagement with the support to which it is to be transferred.

The sockets or recesses in the rotary carrier-supports E and the plate F, which in the present construction is the base of the spool-carrier, is but one form of co-operating parts whereby the carriers are seated upon the rotary supports, and by the terms "co-operating projections" and "recesses," used in the claims, I wish to be understood as referring broadly to a means for seating the carriers on the supports in such manner that they may be retained by the latches when the rotation is in one direction, whether the recesses be in the support E and the ends of the plate F be the projections, as shown, or *vice versa*.

As far as the operation of my device is concerned, it is immaterial whether the latches are placed on the supports or gears E or upon the carrier-plates F so long as the relative movements of the latches, inclines and grooves are preserved. The slots F^2 and inclines F^3

on opposite sides of the spool-carrier plate in connection with spring-latches on the supports E constitute what I term a "reversed" latch connection between the parts—that is, one in which the transfer of the carrier from one support to the other is caused by the direction of the movement of the support relative to the carrier.

I claim as my invention—

1. In a machine for making wire fabric, the combination of a series of rotary supports, a series of spool-carriers having spools thereon, co-operating projections and recesses between the carriers and supports, and latch devices for holding the carriers on the supports when the latter are moved in one direction, relatively, substantially as described.

2. In a machine for making wire fabric, the combination of a series of rotary supports, a series of spool-carriers and spools thereon, co-operating projections and recesses between the carriers and supports, and reversely operating latch devices between the opposite sides of the spool-carriers and the adjacent supports, substantially as described.

3. In a machine for making wire fabric, the combination of a series of rotary supports, a series of spool-carriers and spools thereon, co-operating projections and recesses between the carriers and supports, and automatic carrier transferring and holding devices, substantially as described, between the supports and opposite sides of the spool-carriers, said transferring devices embodying latches and co-operating engaging parts, which are reversed on opposite sides of the carrier, whereby the carriers will be transferred from one support to the next when the latter are rotated in one direction, and the latches will yield and permit their passage without transferring when moving in the opposite direction, substantially as described.

4. In a wire fabric machine, the combination with a series of rotary supports, each having two latches, of a series of spool-carriers having reversed recesses and inclines on opposite sides for the engagement of the latches on the supports, substantially as described.

5. In a wire fabric machine, the combination with a series of rotary supports, the adjacent ones moving in opposite directions, of a series of spool-carriers and reversed latch connections between opposite sides of the carriers and the adjacent supports, whereby the carriers will be transferred from one support to another when rotated in one direction and back again when rotated in a reverse direction, substantially as described.

6. In a wire fabric machine, the combination with two or more rotary supports connected for operation in opposite directions, of a spool-carrier and reversed latch connections between opposite sides of said carrier and the supports, substantially as described and for the purpose specified.

7. In a wire fabric machine, the combination with a series of rotary supports, having intermeshing gears, and apertures for the passage of warp wires, of a series of spool-carriers and reversed latch connections between opposite sides of the carriers and adjacent supports, substantially as described.

8. In a wire fabric machine, the combination with a series of

rotary supports having apertures for the passage of warp wires and intermeshing gears, of a series of spool-carriers, co-operating projections and recesses on the carriers and supports and reversed latch connections, substantially as described, between opposite sides of the carriers and adjacent supports, whereby the alternate supports will move the carriers around the warp wires when operated in one direction and when operated in the other direction the carriers will be transferred to the supports intermediate those first operating them, substantially as described.

9. In a wire fabric machine, the combination with the main frame, having a series of tubes, and a series of gears on the tubes, having the latches and recesses or sockets, of a series of spool-carriers, having the reversed inclines and slots co-operating with the latches, and the spool frame adapted to bear against the tubular extensions on the main frame, substantially as described.

10. The combination with the intermeshing gears, each having the outer plate, studs and latches thereon, of the spool-carriers having the reversed slots and inclines on opposite sides, and the grooves co-operating with the studs on the gears, substantially as described.

11. In a wire fabric machine, the combination with the main frame, the extensions thereon and the rotary supports, of the spool-carriers, and automatic transferring devices, substantially as described, between the opposite sides of the supports and of the carriers, bearing surfaces on the carriers engaging the extensions on the frame and co-operating holding recesses and projections between the supports and carriers, substantially as described.

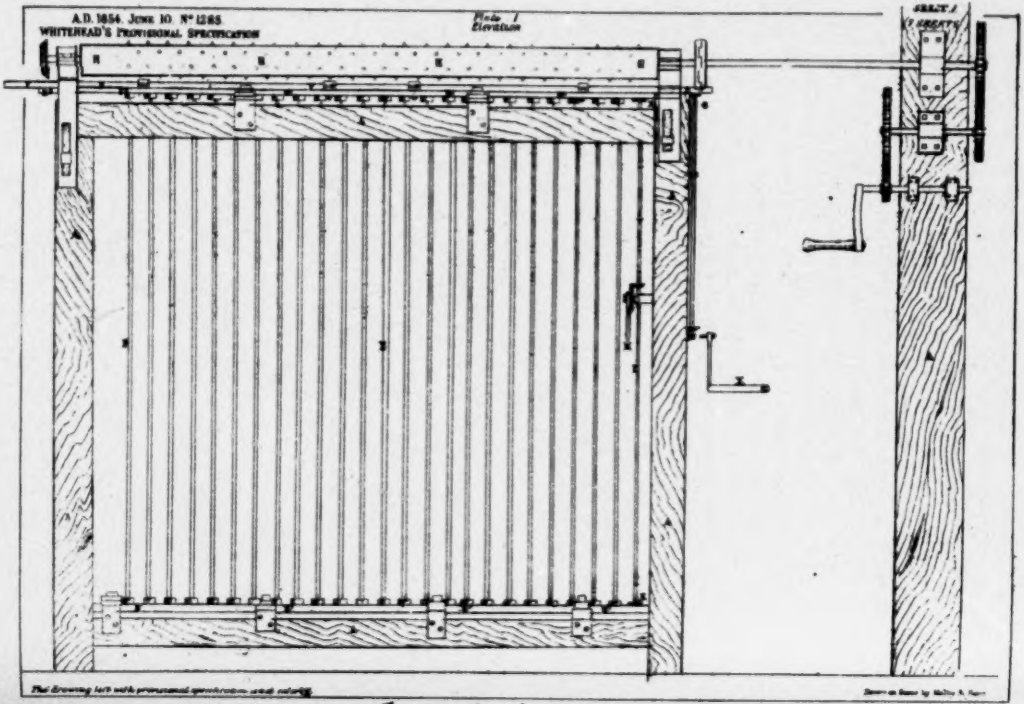
12. In a fence machine, the combination with the main frame, having wire-twisting devices thereon, of an operating device
771 for moving the frame consisting of a lever pivoted thereon, and the co-operating wire-clamping jaws connected to said lever and adapted to grip one of the longitudinal wires of the fence, when the lever is moved in one direction, substantially as described.

13. The combination with a fence machine embodying a main frame and wire-twisting devices thereon, of a lever pivoted on the frame, a wire-clamp sliding on a fence wire, and having jaws adapted to engage said wire and connections between said jaws and the lever, substantially as described.

WILLIE D. WHITNEY.

Witnesses:

J. B. CHURCH,
G. A. RODA.



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Mackenzie & Abbott
p. 774

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PLATE 2

FIG.1.

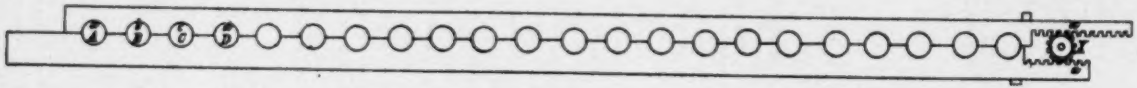

FIG.2

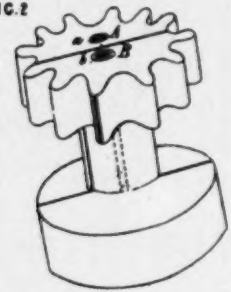

FIG 2a

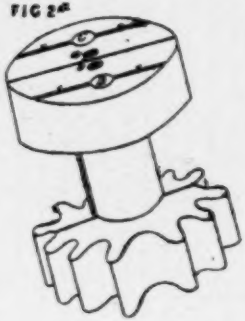

FIG.3.

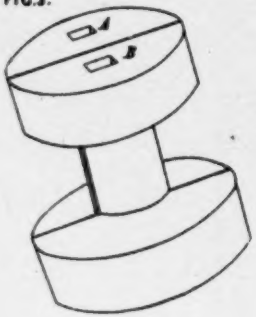

FIG.4

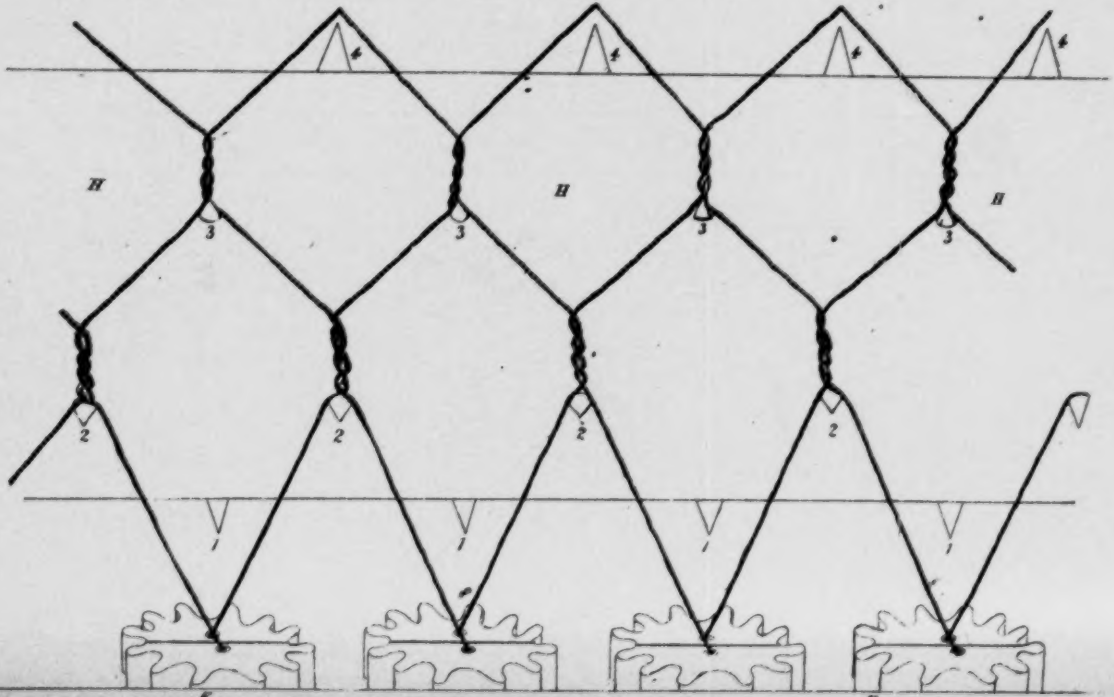

Plate 1.

Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.
Fig. 9.
Fig. 10.
Fig. 11.
Fig. 12.
Fig. 13.
Fig. 14.
Fig. 15.
Fig. 16.
Fig. 17.
Fig. 18.
Fig. 19.
Fig. 20.
Fig.

PLATE. 4.

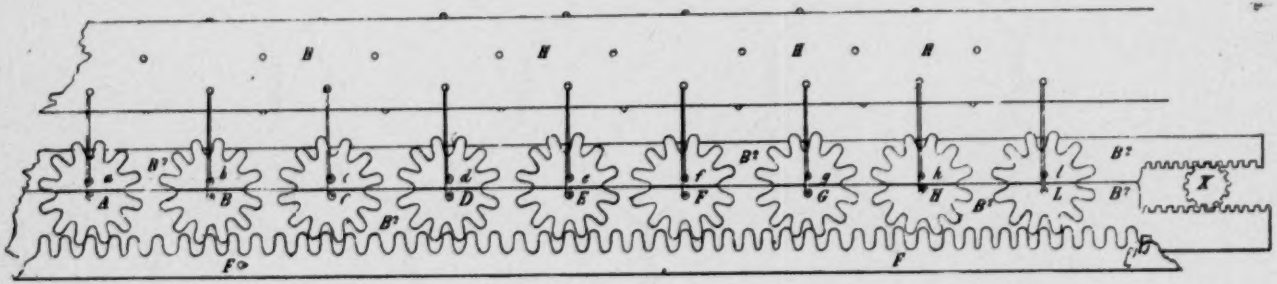

PLATE. 5.

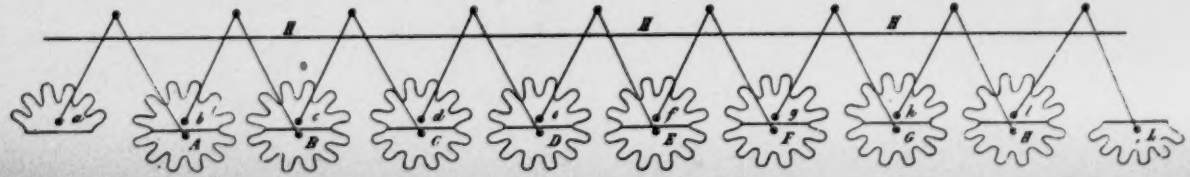

PLATE 6.

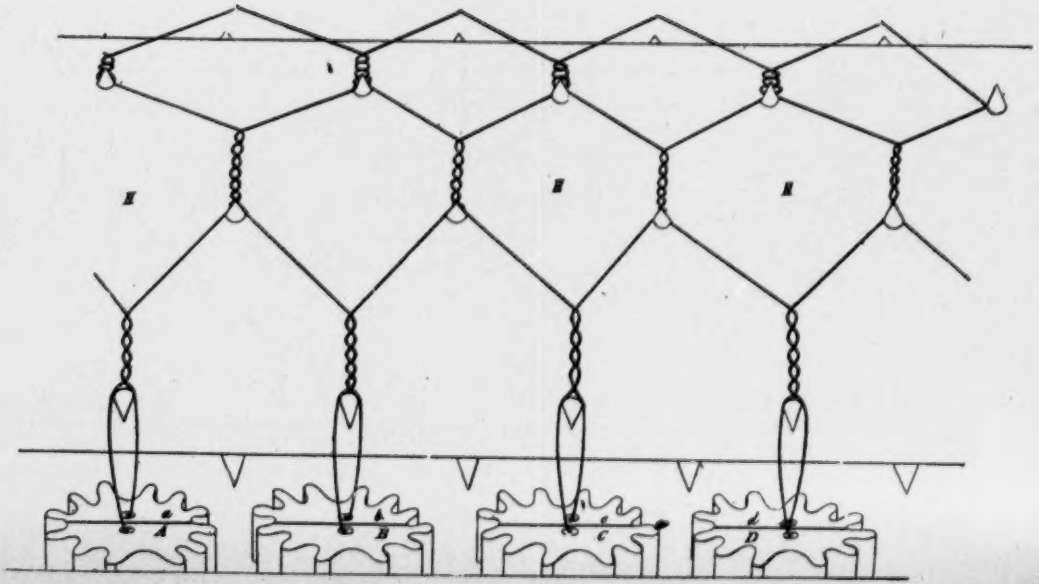

PLATE 7.

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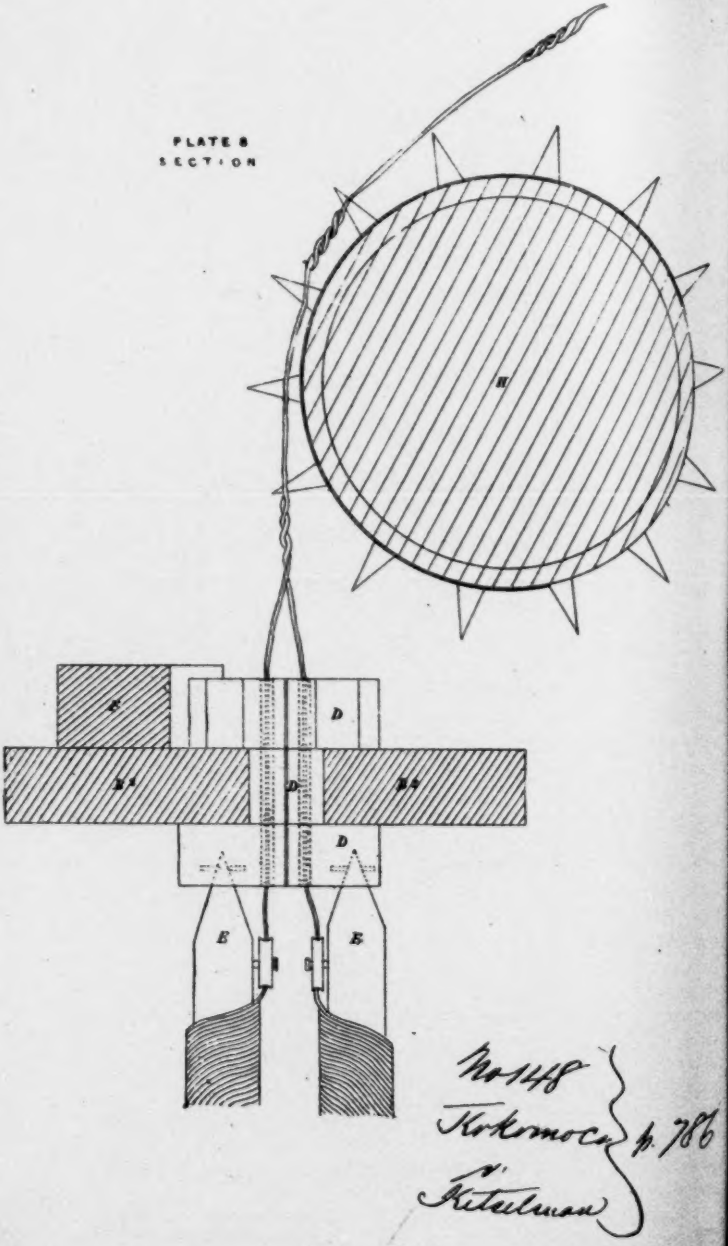
PLATE 8
SECTION



No 148
Kokomo
v.
Kitselman

772

A. D. 1854. No. 1285.

Machine for Weaving Wire Netting.

(This invention did not proceed to the great seal.)

Provisional specification left by John Whitehead at the office of the Commissioner of Patents, with his petition, on the 10th June, 1854.—A communication.

I, John Whitehead, of Preston, in the county of Lancaster, agricultural-implement maker, do hereby declare the nature of the said invention for "a machine for weaving wire netting of iron, brass, or other material," to be as follows:—

My invention will be the best understood by the following description, accompanied by a reference to the accompanying drawings, plate 1.

(Here follow diagrams marked pp. 774–776, 777, 778, 779, 780, 781, 782, 783, 784, 785, & 786.)

This represents the elevation of the machine A, A, A, A, is a strong upright wooden frame; C, C, C, C, are a number of iron wheels; D, D, D, D, are a set of brass wheels, similar to the wheels C, C, C, C, but having the upper periphery cogged. Plate 2, Fig. 3, represents the wheels C, C, C, C, which are split into two equal parts. A and B, Fig. 2, represents the wheels D, D, D, D, which are also split into two equal parts, A and B, having the upper periphery cogged, as before mentioned, and having in each half a perforation, *a* and *b*, through the wheel, as shown by the dotted line. The wheels C, C, C, C, (plate 1), revolve upon their own axis in "steps" formed by a plate B, B, and the wheels D, D, D, D, revolve upon their own axis in another similar plate B^2. Plate 2, Fig. 1, represents the plate B, B, and the similar plate B^2, in which the wheels D, D, D, D, revolve. It is divided up the middle, thus forming two plates; the circular perforations, which are the "steps" in which the shanks of the wheels turn, have their centre on the line of division. These plates have each a rack *a*, *a*, at the same end, betwixt which and acting upon each is a pinion *x*; hence, when the pinion *x* revolves, the two sides of the plate slide in opposite directions, so that each half of the holes forming the steps is transposed; the half *b* going to the half A, the half *c*, going to the half B, the half *d* going to the half C, and so on, through the series. The plate B, B, and the similar one B^2, in which the wheels D, D, work, are made to slide, as before described, by moving the winch M (plate
773 1), which operates upon the pinions *x*, *x*. It will be evident that the halves of the wheels C, C, and D, D, will be trans-

posed in the same manner as the "steps" in which they revolve, Fig. 1, (plate 2.)

Plate 1, E, E, E, E, are two rows of spindles, one spindle being behind each, shewn in the sketch. There is one spindle to each half wheel; the spindles fit at bottom into the wheels C, C, C, C, and at top into the wheels D, D, D, D, and they all revolve together. Plate 2, Fig. 4, represents a spindle. *a* is a square tenon, which fits into the shoe B, and is fastened by the set-screw *b*. This shoe B fits into the hole B of the wheel C, (Fig. 3, plate 2,) the hole A being occupied in like manner with the shoe of another spindle. The top of the spindle has a cross-pin, which fits into a "slot" in the bottom of the wheels D, D, D, plate 1, as shewn in Fig. 2*a*, plate 2, which represents one of the wheels D, D, upside down. This cross-pin is simply to make the spindle turn with the wheel D, plate 1. F, F, F, is a toothed rack, worked backwards or forwards by the pinion G; the cogged periphery of the wheels D, D, D, gears into this toothed rack, and therefore the wheels revolve on their axis when the rack is moved. Plate 1, H, H, H, is an iron roller, having pegs fixed upon it, as shewn plate 3. The spindles E, E, E, plate 1, are removed from their place by unscrewing the set-screw in the shoe, and dropping them out of the wheels D, D, D. The wire to be manufactured into netting is then coiled (see plate 2, Fig. 4,) upon the spindle; the end is passed over the little pulley *d*, (plate 2, Fig. 4,) and through the perforations of the wheels D, D, and is carried up and fastened to the pegs of roller H, H, as shewn, plate 4. It will be seen that there are two spindles to each wheel, and the wires from the two spindles pass each through different halves of the wheel. When the wires are thus secured the wheels D, D, C, C, and the spindles E, E, are made to revolve on their own axis by turning the handle K, which gives motion by means of the pinion G and the toothed rack; this causes the wires to be twisted together. When this has been effected, the pinions *x*, *x*, are set in motion by means of the handle M. They act upon the divided plates B, B, and the similar ones B^2, in which the wheels D, D, revolve, and transpose the halves of the wheels, in the manner before described, and which is illustrated by comparing plates 4 and 5. The half *a* of the wheel *a*, A, is shifted forwards, (and being the outside half wheel it is isolated, and so forms the selvedge;) the half *b* of the wheel *b*, B, is shifted to the half A of the wheel *a*, A, the half C of the wheel *c*, C, is shifted to the half B of the wheel *b*, B, and so on, through the series. In plate 3 the work is represented as standing in this position.

The first process then is to twist the wires, by turning the winch K, and causing the wheels D, D, and C, C, to revolve on
788 & 789 their own axis. When the wires are twisted, the next process is to turn the roller H, H, so far that the pegs number 1 shall move to a piston half way betwixt the pegs number 1 and 2, as they stand in the sketch, plate 3. The position then assumed is shewn in plate 6, the mesh being still hooked upon the pegs 2 and 3, and the wire being drawn through the wheels D of length sufficient to form one-half of the mesh. The next operation

is to transpose the halves of the wheels, as before described, by moving the pinions x, x; this stretches out the wire forming half the mesh, as shewn in plate 7. The next process is to turn the roller H, H, just so much as before; this causes the pegs number 1 in plate 7 to hook up the newly formed half mesh. The wire is then twisted again the roller is again turned, and the wire drawn up; the position of the half wheel is reversed, the wire is twisted again, and a complete mesh is formed.

The web thus formed passes over the roller H, H, the pegs of which leave it, as shewn in section, plate 8, and it is carried through drawing rollers and rolled on a wooden mandril. There is on each of the plates B, B, and the similar ones B^2, in which the half wheels D, D, D, D, revolve, a stop, to prevent the possibility of misplacing the halves of the holes which form the "steps," in which the said half wheels revolve, so that the workmen in shifting these plates in the manner herein described cannot shift them beyond the required point. I do not limit the size of the mesh or the width of the web.

What I claim to be new in my invention are,—

First, the spindles E, E, E, E, on which the wire is coiled, and the shoes in which they fit; likewise the half wheels C, C, C, C, and D, D, D, D, and the plates B, B, and the similar ones B^2, in which the wheels D, D, D, D, revolve; also the mechanism by which these plates are shifted in order to transpose the half wheels C, C, C, C, and D, D, D, D, in the manner hereinbefore described.

Secondly, the toothed rack into which gear the cogged peripheries of the half wheels D, D, D, D, and the mechanism by which the said half wheels are made to revolve, so as to twist the wires together.

Thirdly, the general arrangement of the machine and the manner hereinbefore described of using it for the purpose of making wire netting.

790&791 A. D. 1876, 17th June. No. 2516.

Wire Netting.

(This invention received provisional protection only.)

Provisional specification left by William Smith at the office of the Commissioner of Patents on the 17th June, 1876.

WILLIAM SMITH, of Carrington Street bridge works, Nottingham.

"*Improvements in the Manufacture of Wire Netting and in the Machinery to be Employed Therein.*"

My invention relates to certain improvements in the manufacture of wire netting, and in the machinery to be employed therein, the object being to produce a stronger netting than the present, which is liable to bulging and fracture by the action of sheep and other animals.

The improvements consist in forming in the general work or process a series of strengthening wires, either single wires, or compound, or cable wire, the same passing alternately through the twists and meshes so as to prevent the netting from stretching or breaking. These wires of course run parallel with the direction of the work, and are secured by being surrounded and gripped by every twist of the mesh. They may be applied through all the meshes or through alternate meshes, or in sheep netting through as many series as required.

I apply to the lower part of the machine feeding bobbins, supplied with the wires or cables, which pass up to the work in suitable guides, and I cut a space out of the centre of one of the halves of the twisting wheels (which are always made in two parts) so that my wires shall pass through; then when the divisions of the wheels are carried apart by the ordinary sliding bars my wires are pushed by guides out of the spaces in the wheels into slots in one of the sliding bars about midway between the turning wheels and on the opposite side of its half wheel, so that my wire may be held while the twist is made, and they are thus relieved from the action of the twisting wires which form the mesh. Or I divide the twisting wheels into three parts, my extra wire passing through the central division, and the two side segments travel to and fro to form the twist, leaving the central division in position with my supplementary wire therein maintained.

For cattle fences, which are required of great strength, this invention will be of especial application; and for garden and house fencing, where finer work is required, the article will prove much stronger than the ordinary netting.

792 And afterwards, to wit, at the May term of said court, on the 9th day of October, 1899, before Honorable John H. Baker, judge of said court, the following further proceedings in the above-entitled cause were had, to wit:

Decree, Oct. 9, 1899.

Come now the parties, the complainants by Robert H. Parkinson, Esq., their solicitor, and the defendants by Blacklidge & Shirley and Banning & Banning their solicitors, and this cause having been submitted to the court upon the pleadings, testimony and exhibits, and the argument of counsel having been heard and considered, and the court being sufficiently advised in the premises finds that the equity of this cause is with the defendants.

It is therefore ordered, adjudged and decreed by the court that the bill of complaint herein be, and the same is hereby dismissed for want of equity.

And it is further ordered, adjudged and decreed that the complainants do pay to the defendants their costs herein expended, taxed at $—.

In the Circuit Court of the United States for the District of Indiana.

ALVA L. KITSELMAN and DAVIS M. KITSELMAN
vs.
KOKOMO FENCE MACHINE COMPANY, JESSE H. SROFE, JOHN E. FREDERICK, KITTIE SROFE, GEORGE W. FREDERICK, and JOEL WARD.
} No. 9574. Chancery.

Opinion of the Court.

BAKER, *J.*:

This is a suit for infringement of claims 1 and 2 of letters patent No. 289,507 issued December 4, 1883, to W. J. Davisson for an improved machine for making wire fabrics; claims 1, 2, 3, 9, 10, 11, 15 and 20 of letters patent No. 356,322 issued January 18, 1887, to Alva L. Kitselman and Davis L. Kitselman, for an improvement in wire-fabric machines; claims 2, 3, and 4 of letters patent No. 357,067 issued February 1, 1887, to Theodore M. Connor for improvements in machines for forming netted wire fabrics; and claims 1
793 and 10 of letters patent No. 505,607 issued September 26, 1893, to John C. Pope, assignor to the complainants for a wire-fabric machine.

The defendants deny patentable novelty of each of the patents in view of the prior art, and also deny infringement, alleging that they construct their wire-fencing fabric as licensees under and pursuant to letters patent No. 552,025 issued to W. D. Whitney December 24, 1895, for improvements in wire-fabric machines.

Waiving the question whether want of patentable novelty is shown, in view of the state of the art disclosed in the record, it is quite certain that none of the complainants' patents have the quality of a pioneer invention. They are simply what they profess to be, improvements on the prior art, and are to be construed in the light of the principles applicable to patents for mere improvements. The complainants

are not entitled to be treated on the basis that they or their assignors were the first to make a portable machine for weaving wire-fencing fabric in the field. Such a claim was distinctly made, as is shown by the file-wrapper and contents in the record, and was rejected by the Patent Office, and the claim was thereupon withdrawn.

The complainants and defendants must contend as to the question of infringement on an equal field. Corning *v.* Burden, 15 How., 271. While the issuance of the complainants' patents raises a presumption of their validity, the issuance of the subsequent patent to Whitney is entitled to the same presumption of validity. The inventor of the first improvement cannot invoke the doctrine of equivalents to suppress all improvements which are not mere colorable invasions of the first. McCormick *v.* Talcott, 20 How., 405. Construing the complainants' patents in the light of these principles, it cannot be held that the invention practiced by the defendants infringes any claim of either of the complainants' patents.

Turning to the patents in detail, many differences are found between the Davisson machine and that of the defendants, and these differences are not mere colorable invasions. In the former the hollow spindles rotate, while in the latter they are stationary; in the former the hollow spindles are alternately advanced and retracted, while in the latter they always remain in a fixed position; in the former the spindles must be advanced and retracted to effect a transfer of the spools, while in the latter no such movement occurs; in the former the spindles are provided with cross-heads at their further ends from the supporting frame, while in the latter the so-called cross-heads are fixed to the gears near the supporting frame; in the former the cross-heads have a fixed and rigid connection with the spindle, while in the latter the so-called cross-heads are
794 loosely mounted on the spindles; in the former the rotation of the spools depends upon the rotation of the spindles, while in the latter there is no rotation of the spindles; in the former the spools are transferred by direct lateral movement in the line of the length of the cross-heads, while in the latter they are transferred by rotating through a curved path; in the former the transfer of all the spools is effected by a single integral device or shifting frame, while in the latter each spool-carrying frame is transferred by itself; in the former the transfer of the spools is effected while the power is constantly applied in the same direction, while in the latter the power must be stopped and reversed before the transfer can be effected; in the former the cross-heads are brought into a line end to end, and the spools are moved endwise in the direction of their axes, while in the latter the so-called cross-heads constantly remain in the same plane and the spool-carriers are not shifted by moving them in the direction of their axes; in the former the bearings for the spindles must be movable endwise, while in the latter they are stationary. The cross-heads on the former, and the so-called cross-heads of the latter are not interchangeable or transferrable from one machine to the other without such a reorganization as would destroy their identity. These differences show that

the identity of means and of operation necessary to infringement are wanting.

The testimony discloses the following differences between the Kitselman machine and that of the defendants. In the former the spool-carriers are shifted from one section to another by sliding them in a straight path, while in the latter they are rotated through a curvilinear path; in the former all the spool-carriers at one side of the spindles are attached together and move from one section to another by means of a common bar, while in the latter the spool-carriers are each separate from, and move independently of, the others; in the former the spindles are fastened to the pinions and rotate with them, while in the latter the spindles are fastened to the frame and have the pinions loosely mounted on them, and they do not rotate with the spindles; in the former the spool-carriers are shifted from one section to another by a hand lever provided for that purpose, while in the latter they are shifted without any lever simply by reversing the direction of the rotation of the crank; in the former the spool-carriers are required to be supported at both ends, while in the latter they are only required to be supported at one end; in the former the spool-carriers can readily be taken out and turned end for end and reinserted in place again, while in the latter this cannot be done; in the former its capacity to operate would be destroyed if the hollow spindles were made stationary, while in the latter they can be made rotative instead of
795 stationary, if desired; in the former the segmental ends of the side sections of the twisters make, with the lateral end pieces of the central sections, wheels at both ends of the twisters, which rest in supports which permit their rotation, while in the latter the ends of the central spindles and the spool-carriers form no wheels and are received in no bearings; in the former the spool-carriers cannot be transferred except when the parts have been brought to a position of rest and the pinions are stationary, while in the latter the spool-carriers cannot be transferred when the pinions are at rest, but only when they are rotated. The spool-carriers in the former and those in the latter are so different, and are mounted and operated in such radically different ways, that they cannot be interchanged or transferred from one machine to the other without reorganization. The machines are constructed on different theories and are intended to work in different ways. They lack identity of means and of operation essential to constitute infringement.

The testimony in regard to the Connor patent shows that there are many differences in the construction and operation of a machine constructed under that patent and the machine constructed by the defendants. The driving mechanism of the former is constantly applied in one direction, while in the latter it is reversed at intervals at the will of the operator, and must be so reversed to secure the desired result; in the former the hollow spindles rotate to do their work, while in the latter they are stationary; in the former the spools are required to be supported at both ends, while in the latter they are supported at one end only; in the former the spool-carriers are carried around by notches in the disks mounted on the rotating

spindles, while in the latter they are carried entirely by other means; in the former notched disks in which the spool-carriers rest are required to be surrounded by the walls of the openings in which they are placed, to prevent them from flying at a tangent while being carried around, while in the latter they are not surrounded, nor required to be surrounded by any retaining wall to keep them in place; in the former the spool-carriers can only be transferred by rotating the parts constantly in one direction, while in the latter they can only be transferred by reversing the direction of rotation; in the former the spool-carriers in the act of transference from one spindle to another first passes and must pass to the opposite side of the spindle, while in the latter they pass and must pass from the one spindle to another on the same side; in the former they are pivoted switches which, at stated intervals, turn on their pivots into new positions and thus automatically change the path of travel of the spool-carriers, while in the latter there are no pivoted switches for such purpose; in the former the switches are
796 turned from one position to another by bars parallel to the line of the twisters and operating simultaneously on all the switches, while in the latter the parts called switches are not operated by bars, or by any single common means acting simultaneously upon all of them; in the former the spool-carriers never come into position between the two spindles where they can be transferred at will from one to the other, while in the latter they do come into such position and can be transferred at will, and they are incapable of transfer until they do come into such position; in the former the spool-carriers are always transferred from the notches of one pair of disks into the notches of an oppositely rotating pair of disks, while in the latter they are transferred into disks rotating in the same direction; in the former the disks which carry the spool-carriers constantly run in opposite directions, while in the latter they run alternately in opposite directions, in the former the automatic switches are not carried around by the rotating disks and have no connection with them, while in the latter the parts called switches by complainants' experts are attached to the disks and are constantly carried around with them. These differences in construction and operation make it apparent that the defendants' machine does not contain substantially the same mechanism and operate substantially in the same way as the Connor machine. In my opinion there is lacking identity of means and of operation which are essential to infringement.

In the Pope machine the twister wheels are provided with T-shaped grooves in their faces, while the defendants' machine is not provided with any kind of grooves on their wheel faces; in the former the spool-carrier is provided with a T-shaped tongue adapted to be received into the T-shaped groove in the face of the twister wheel, while in the latter such groove and tongue are entirely wanting; in the former the twister wheels and spool-carriers cannot be engaged nor the spool-carriers shifted without the T-shaped grooves and tongues, while the latter would be inoperative if such method were attempted; in the former all the spool-carriers on the respective

sides of the spindles are shifted up and down by sliding bars simultaneously engaging all on one side and transferring them as a single operation, while in the latter there are no sliding bars, and the spool-carriers are not transferred as a single operation, but each is transferred separately and independently; in the former the spool-carriers are transferred from one spindle to another by a direct, sliding movement along a straight line, while in the latter they are transferred by a rotary movement and through a curved line; in the former the twister wheels are stationary when being
797 transferred, while in the latter they are, and must be, rotative; in the former the transfer of the spool-carriers is effected by means of a hand lever independently of the crank for actuating the twister wheels, while in the latter the transfer is effected by the crank in the operation of the machine. In view of these differences the court fails to find the substantial identity of means and operation without which there can be no infringement.

The bill of complaint will therefore be dismissed for want of equity, at the complainants' costs.

And afterwards, to wit, at the May term of said court, on the 30th day of October, 1899, before Honorable John H. Baker, judge of said court, the following further proceedings in the above-entitled cause were had, to wit:

Petition for Appeal and Assignment of Errors. Filed Oct. 30, 1899.

Come now the complainants by counsel, and files *his* petition for appeal and assignment of errors herein, in the words following, to wit:

Now come the complainants herein, the above-mentioned Alva L. Kitselman and Davis M. Kitselman, copartners as Kitselman Bros, and respectfully pray the allowance of an appeal from the decree dismissing the bill entered by this court herein to the United States circuit court of appeal- for the seventh circuit, and submit the following assignments of error to the aforesaid decree, to wit:

Assignment of Errors. Filed Oct. 30, 1899.

That the court —

First. In dismissing the bill of complaint; whereas it should have granted the relief therein prayed.

Second. In finding that the defendants have not infringed the letters patent in suit; whereas it should have found that they have infringed the 2nd and 3rd claims of the Davisson patent, the 1st, 2nd, 9th, 10th, 11th, 15th, and 20th claims of the Kitselman patent, the 2nd and 3rd claims of the Conner patent and the 1st, 9th and 10th claims of the Pope patent, and granted an injunction and account thereunder, as prayed in the bill.

Third. In failing to find that the Davisson patent here in suit was good and valid; that it was the property of complainants; that the defendants had infringed complainants' exclusive rights thereunder,

and particularly the 2nd and 3rd claims thereof; and to grant complainants an injunction and account of profits and damages thereunder against defendants and each of them.

Fourth. In failing to find that the Kitselman patent here in suit was good and valid; that it was the property of complain-
798 ants; that the defendants had infringed complainants' exclusive rights thereunder, and particularly the 1st, 2nd, 9th, 10th, 11th, 15th and 20th claims thereof; and to grant complainants an injunction and account of profits and damages thereunder against defendants and each of them.

Fifth. In failing to find that the Conner patent here in suit was good and valid; that it was the property of complainants; that defendants had infringed complainants' exclusive rights thereunder, and particularly the 2nd and 3rd claims thereof; and to grant complainants an injunction and account of profits and damages thereunder against defendants and each of them.

Sixth. In failing to find that the Pope patent here in suit was good and valid; that it was the property of complainants; that defendants had infringed complainants' exclusive rights thereunder, and particularly the 1st, 9th and 10th claims thereof; and to grant complainants an injunction and account of profits and damages thereunder against defendants and each of them.

Seventh. In failing to find that the equities were with the complainants and to grant a decree against defendants for injunction and account under the several letters patent set forth in the bill of complaint, with the costs of suit.

ROB'T H. PARKINSON,
Solicitor and Counsel for Complainants.

And thereupon it is ordered by the court that said appeal be and the same is hereby allowed upon the filing of an appeal bond in the sum of $1,000.

And the complainants now file their appeal bond herein in the penal sum of one thousand dollars, which bond is approved by the court, and is in the words following, to wit:

Appeal Bond.

Know all men by these presents, that we, Alva L. Kitselman and Davis M. Kitselman, as principals, and —— ——, as sureties, are held and firmly bound unto Kokomo Fence Machine Co., Jesse H. Srofe, Harry Ward, John E. Frederick, Kittie Srofe, George W. Frederick, Jesse Ward, in the full and just sum of one thousand dollars ($1,000), to be paid unto the said Kokomo Fence Machine Co., Jesse H. Srofe, Harry Ward, John E. Frederick, Kittie Srofe, George W. Frederick and Joel Ward, their certain attorneys, executors, administrators, or assigns; to which payment, well and truly to be made, we bind ourselves, our heirs, executors and admin-
799 istrators, jointly and severally, by these presents.

Sealed with our seals and dated this twenty-third day of October, in the year of our Lord one thousand eight hundred and ninety-nine.

Whereas, lately at a session of the United States circuit court for the district of Indiana in a suit depending in said court between Alva L. Kitselman and Davis M. Kitselman complainants and Kokomo Fence Machine Co., Jesse H. Srofe, Harry Ward, John E. Frederick, Kittie Srofe, George W. Frederick, and Joel Ward, defendants, a decree was rendered against the said Alva L. Kitselman and Davis M. Kitselman and the said Alva L. Kitselman and Davis M. Kitselman have prayed an appeal and filed a petition therefor in the clerk's office of the said court to reverse the decree in the aforesaid suit, and for a citation directed to the said Kokomo Fence Machine Co., Jesse H. Srofe, Harry Ward, John E. Frederick, Kittie Srofe, George W. Frederick and Joel Ward citing and admonishing them to be and appear at a United States circuit court of appeals, for the seventh circuit, to be holden at Chicago within 30 days from the date hereof.

Now, the condition of the above obligation is such, that if the said Alva L. Kitselman and Davis M. Kitselman shall prosecute their appeal to effect, and answer all damages and costs if they fail to make their plea good, then the above obligation to be void; else to remain in full force and virtue.

ALVA L. KITSELMAN. [SEAL.]
DAVIS M. KITSELMAN. [SEAL.]

Sealed and delivered in presence of—

ROBERT MILLER.
OSLON F. BARBER.

Approved by

JOHN H. BAKER, *Judge.*

We consent to the acceptance and approval of this bond.

BANNING & BANNING.

800 *Clerk's Certificate.*

UNITED STATES OF AMERICA, } ss:
District of Indiana, }

I, Noble C. Butler, clerk of the circuit court of the United States for the district of Indiana, do hereby certify that the above and foregoing is a full, true and complete transcript of the record and proceedings in the cause of Alva L. Kitselman *et al. vs.* Kokomo Fence Machine Company *et al.*, No. 9754, as fully as the same appears of record and remains on file in my office.

Witness my hand and the seal of said court, at Indianapolis in said district, this 13th day of November, A. D. 1899.

[SEAL.] NOBLE C. BUTLER, *Clerk.*

Citation.

Chancery.

United States of America to Kokomo Fence Machine Company, Jesse H. Srofee, Harry Ward, John E. Frederick, Kittie Srofe, George W. Frederick, and Joel Ward, Greeting:

You are hereby cited and admonished to be and appear at a United States circuit court of appeals for the seventh circuit, to be holden at Chicago thirty days after the date hereof, pursuant to an appeal which has been allowed by the circuit court of the United States for the district of Indiana, from its final decree in a suit wherein Alva L. Kitselman and Davis M. Kitselman — appellant-, and you are appellee-, to show cause, if any there be, why the decree rendered against the said appellant- as in the said appeal, should not be corrected, and why speedy justice should not be done to the parties in that behalf.

Witness the Hon. John H. Baker, judge of the district court of the United States for the district of Indiana, and *ex officio* judge of said circuit court, this 30th day of October in the year of our Lord, one thousand eight hundred and ninety-nine.

[SEAL.] JOHN H. BAKER, *Judge.*

We hereby accept service of the foregoing citation on behalf of the defendants, and waive service thereof.

BANNING & BANNING,
Solicitors for Defendants.

801 *Order as to Use of Public Records. Filed Dec.* 6, 1899.

United States Circuit Court of Appeals for the Seventh Circuit.

ALVA L. KITSELMAN and DAVIS M. KITSELMAN, Copartners as Kitselman Bros., *vs.* KOKOMO FENCE MACHINE COMPANY, JESSE H. Srofe, Harry Ward, John E. Frederick, Kittie Srofe, George W. Frederick, and Joel Ward.	No. 647.	In Equity.

Upon motion of appellants, it is hereby ordered that the appellants have leave to use in this court the printed records used below, upon the same receiving the approval of the clerk if they conform or are made to conform to the rules of the court.

WM. A. WOODS,
Pres. Judge.

Satisfactory.
BANNING & BANNING.

(Endorsed:) Filed Dec. 6, 1899. Edward M. Holloway, clerk.

802 United States Circuit Court of Appeals for the Seventh Circuit.

I, Edward M. Holloway, clerk of the United States circuit court of appeals for the seventh circuit, de hereby certify that the foregoing printed pages, numbered from 1 to 801, inclusive, contain a true copy of the printed record filed in this court on the thirtieth day of January, 1900, which was prepared for the printer, indexed, supervised and distributed by me in accordance with the rules of this court and upon which said cause was determined by the United States circuit court of appeals for the seventh circuit in the case of Alva L. Kitselman and Davis M. Kitselman, copartners as Kitselman Bros., *vs.* Kokomo Fence Machine Company, Jesse H. Srofe, Harry Ward, John E. Fredericks, Kittie Srofe, George W. Frederick and Joel Ward, No. 647 October term, 1899, as the same remains upon the files and records of the United States circuit court of appeals, for the seventh circuit.

Seal United States Circuit Court of Appeals, Seventh Circuit.

In testimony whereof I hereunto subscribe my name and affix the seal of said United States circuit court of appeals for the seventh circuit, at the city of Chicago, this twenty-fifth day of May, A. D. 1901.

EDWARD M. HOLLOWAY,
Clerk of the United States Circuit Court of Appeals for the Seventh Circuit.

803 At a regular term of the United States circuit court of appeals for the seventh circuit, begun and held at the United States court-rooms, in the city of Chicago, in said seventh circuit on the third day of October, 1899, of the October term in the year of our Lord one thousand eight hundred and ninety-nine and of our Independence the one hundred and twenty-fourth year.

And afterwards, to wit: on the twenty-fourth day of November, 1899, in the October term last aforesaid, came the appellant, by his counsel, Mr. Robert H. Parkinson, and filed in the office of the clerk of this court his appearance, said appearance being in the words and figures following, to wit:

United States Circuit Court of Appeals for the Seventh Circuit, October Term, 1899.

KITZELMANN
v.
KOKOMO FENCE MACHINE CO. ET AL. } No. 647.

The clerk will enter my appearance as counsel for the appellant.

ROB'T H. PARKINSON.

Endorsed: Filed Nov. 24, 1899. Edward M. Holloway, clerk.

And afterwards, to wit: on the twenty-seventh day of November, 1899, in the October term last aforesaid, came the appellees, by their counsel, Mr. Thomas A. Banning and Mr. Ephraim Banning,

and filed in the office of the clerk of this court their appearance, said appearance being in the words and figures following, to wit:

804 United States Circuit Court of Appeals for the Seventh Circuit, October Term, 1899.

ALVA L. KITSELMAN and DAVIS M. KITSELMAN
vs.
KOKOMO FENCE MACHINE COMPANY ET AL. } No. 647.

The clerk will enter *my* appearance as counsel for the appellees.
THOMAS A. BANNING.
EPHRAIM BANNING.

Endorsed: Filed Nov. 27, 1899. Edward M. Holloway, clerk.

And afterwards, to wit: on the fifth day of December, 1899, in the October term last aforesaid, came the appellees, by their counsel Miller & Drake, and filed in the office of the clerk of this court their appearance, said appearance being in the words and figures following, to wit:

United States Circuit Court of Appeals for the Seventh Circuit, October Term, 1899.

ALVA L. KITSELMAN and DAVIS M. KITSELMAN
vs.
KOKOMO FENCE MACHINE COMPANY ET AL. } No. 647.

The clerk will enter *my* appearance as counsel for the appellees.
MILLER & DRAKE.

Endorsed: Filed Dec. 5, 1899. Edward M. Holloway, clerk.

And afterwards, to wit: on the ninth day of March, 1900, in the October term last aforesaid, there was filed in the office of the clerk of this court a certified copy of petition for appeals and assignment of errors, said copy being in the words and figures following, to wit:

805 In the Circuit Court of the United States for the District of Indiana.

ALVA L. KITSELMAN and DAVIS M. KITSELMAN, Copartners as Kitselman Bros.,
vs.
KOKOMO FENCE MACHINE COMPANY, JESSE H. SROFE, HARRY WARD, JOHN E. FREDERICK, KITTIE SDOFE, GEORGE W. FREDERICK, and JOEL WARD. } No. 9574. Chancery.

Petition for Appeal and Assignment of Errors.

Now come the complainants herein, the above-mentioned Alva L. Kitselman and Davis M. Kitselman, copartners as Kitselman

Bros., and respectfully pray the allowance of an appeal from the decree dismissing the bill entered by this court herein to the United States circuit court of appeals for the seventh circuit, and submit the following assignment of errors to the aforesaid decree, to wit:

That the court erred—

First. In dismissing the bill of complaint, whereas it should have granted the relief therein prayed.

Second. In finding that the defendants have not infringed the letters patent in suit; whereas it should have found that they have infringed the 2nd and 3rd claims of the Davisson patent, the 1st, 2nd, 9th 10, 11th, 15th and 20th claims of the Kitselman patent, the 2nd and 3rd claims of the Conner patent and the 1st, 9th and 10th claims of the Pope patent, and granted an injunction and account thereunder as prayed in the bill.

Third. In failing to find that the Davisson patent here in suit was good and valid; that it was the property of complainants; that defendants had infringed complainants' exclusive rights
806 thereunder, and particularly the 2nd and 3rd claims thereof; and to grant complainants an injunction and account of profits and damaged thereunder against defendants and each of them.

Fourth. In failing to find that the Kitselman patent here in suit was good and valid; that it was the property of complainants; that defendants had infringed complainants' exclusive rights thereunder, and particularly the 1st, 2nd, 9th, 10th, 11th, 15th and 20th claims thereof; and to grant complainants an injunction and account of profits and damages thereunder against defendants and each of them.

Fifth. In failing to find that the Conner patent here in suit was good and valid; that it was the property of complainants; that defendants had infringed complainants' exclusive rights thereunder, and particularly the 2nd and 3rd claims thereof; and to grant complainants an injunction and account of profits and damages thereunder against defendants and each of them.

Sixth. In failing to find that the Pope patent here in suit was good and valid; that it was the property of complainants; that defendants had infringed complainants' exclusive rights thereunder, and particularly the 1st, 9th and 10th claims thereof; and to grant complainants an injunction and account of profits and damages thereunder against defendants and each of them.

Seventh. In failing to find that the equities were with the complainants and to grant a decree against defendants for injunction and account under the several letters patent set forth in the bill of complaint, with the costs of suit.

ROB'T H. PARKINSON,
Sol'r & Counsel for Complainants.

807 UNITED STATES OF AMERICA, } ss:
District of Indiana, }

I, Noble C. Butler, clerk of the circuit court of the United States for the district of Indiana, do hereby certify that the above and

foregoing is a full, true and complete copy of the petition for appeal and assignment of errors filed in said court on the 30th day of October, 1899, in the cause of Alva L. Kitselman *et al. vs.* The Kokomo Fence Machine Company, *et al.*, as fully as the same remains on file in my office.

Witness my hand and seal of said court, at Indianapolis in said district, this 8th day of March, A. D., 1900.

[SEAL.] NOBLE C. BUTLER, *Clerk.*

Endorsed: Filed March 9, 1900. Edward M. Holloway, clerk.

And afterwards, to wit: on the first day of May, 1900, the following proceedings were had and entered of record, to wit:

TUESDAY, *May* 1, 1900.

Court met pursuant to adjournment.

Present: Hon. William A. Woods, circuit judge, presiding. Hon. Peter S. Grosscup, circuit judge. Hon. Christian C. Kohlsaat, district judge.

Order.

It is ordered by the court that Christian C. Kohlsaat, judge of the district court of the United States for the northern district of
808 Illinois, be designated and assigned to sit in this court as a member thereof during the present session.

Thereupon said Kohlsaat appeared and took his seat as a member of said court.

ALVA L. KITSELMAN and DAVIS M. KITSELMAN, etc., *vs.* KOKOMO FENCE MACHINE COMPANY ET AL.	647.	Appeal from the Circuit Court of the United States for the District of Indiana.

It is ordered by the court that this cause be, and the same is set down for hearing May 17, 1900.

And afterwards, to wit: on the third day of May, 1900, in the October term last aforesaid, there was filed in the office of the clerk of this court a certain stipulation, said stipulation being in the words and figures following, to wit:

United States Circuit Court of Appeals for the Seventh Circuit.

ALVA L. KITSELMAN and DAVIS M. KITSELMAN, Copartners as Kitselman Bros., *vs.* KOKOMO FENCE MACHINE COMPANY, JESSE H. SROFE, HARRY WARD, JOHN E. FREDERICK, KITTIE SROFE, GEORGE W. FREDERICK, and JOEL WARD.	No. 647.	In Equity.

The court is respectfully requested by counsel to assign the above-entitled cause for argument at the earliest day after the 8th day of

May, 1900, that meets the convenience of the court, the case being one which, in the opinion of counsel, will require at least a full day.

809 Respectfully,

ROB'T H. PARKINSON,
For Appellant-.
THOMAS H. BANNING,
For Appellee-.

Endorsed: Filed May 3, 1901. Edward M. Holloway, clerk.

And afterwards, to wit: on the tenth day of May, 1901, in the October term last aforesaid, there was filed in the office of the clerk of this court another stipulation, said stipulation being in the words and figures following, to wit:

United States Circuit Court of Appeals for the Seventh Circuit, October Term, A. D. 1899.

ALVA L. KITSELMAN and DAVIS *L.* KITSELMAN, Copartners as Kitselman Bros., Complainants, Appellants,
vs.
KOKOMO FENCE MACHINE COMPANY, JESSE H. SROFE, Harry Ward, John E. Frederick, Kittie Srofe, George W. Frederick, and Joel Ward. } No. 647.

It is hereby agreed—the court consenting—that the hearing in the above-entitled cause may be transferred to Friday the 8th day of June, 1900, and take the place of the case now set for such last-named date.

Chicago, May 10, 1900.

ROB'T H. PAKKINSON,
Attorney for Appellant-.
THOMAS A. BANNING,
BANNING & BANNING,
Attorneys for Appellee-.

Endorsed: Filed May 10, 1900. Edward M. Holloway, clerk.

810 And afterwards, on the same day, to wit: on the tenth day of May, 1900, in the October term last aforesaid, the following further proceedings were had and entered of record, to wit:

THURSDAY, *May* 10, 1900.

Court met pursuant to adjournment.

Present: Hon. William A. Woods, circuit judge presiding. Hon. James G. Jenkins, circuit judge. Hon. Peter S. Grosscup, circuit judge.

ALVA L. KITSELMAN ET AL.
vs.
KOKOMO FENCE MACHINE COMPANY *et al.*
} 647. Appeal from the Circuit Court of the United States for the District of Indiana.

It is ordered by the court that this cause be, and the same is reset down for hearing June 8, 1900.

And afterwards, to wit: on the seventh day of May, 1900, in the October term last aforesaid, the following further proceedings were had and entered of record, to wit:

MONDAY, *May* 7, 1900.

Court met pursuant to adjournment.

Present: Hon. William A. Woods, circuit judge, presiding. Hon. James G. Jenkins, circuit judge. Hon. William H. Seaman, district judge.

811 *Order.*

It is ordered by the court that William H. Seaman, judge of the district court of the United States for the eastern district of Wisconsin be designated and assigned to sit in this court as a member thereof during the present session. Thereupon said Seaman appeared and took his seat as a member of said court.

And afterwards, to wit: on the eighth day of *of* May, 1900, in the October term last aforesaid, the following further proceedings were had and entered of record, to wit:

FRIDAY, *June* 8, 1900.

Court met pursuant to adjournment.

Present: Hon. William A. Woods, circuit judge, presiding; Hon. James G. Jenkins, circuit judge; Hon. William H. Seaman, district judge.

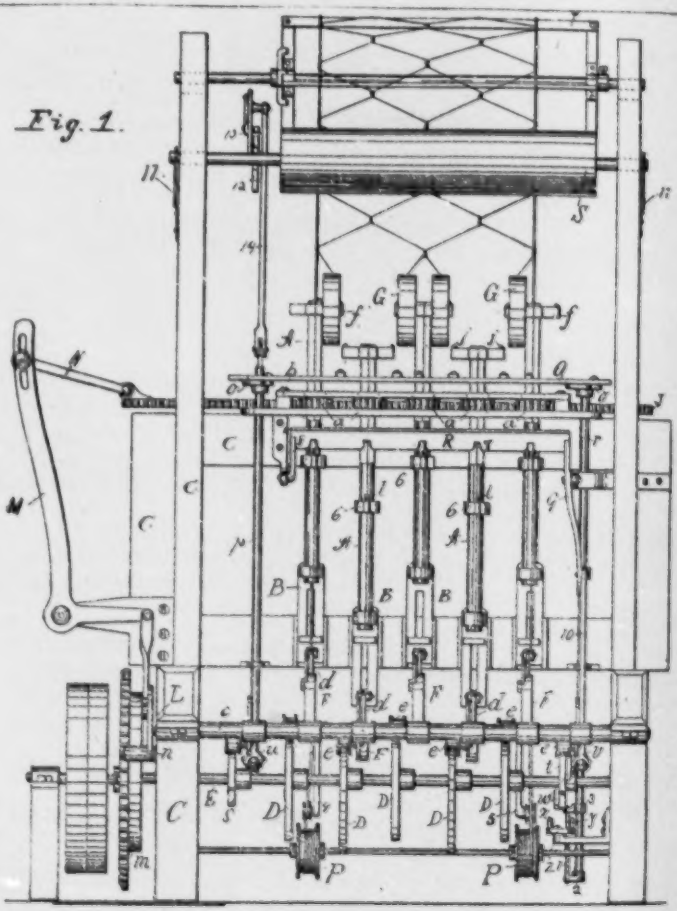
ALVA L. KITSELMAN ET AL.
vs.
KOKOMO FENCE MACHINE Company *et al.*
} 647. Appeal from the Circuit Court of the United States for the District of Indiana.

Now this day come the parties by their — and this cause now comes on to be heard on the printed record and briefs of counsel and on oral argument by Mr. Robert H. Parkinson, counsel for appellant and by Mr. Thomas A. Banning, counsel for appellees, and the court having heard the same takes this matter under advisement.

812 At a regular term of the United States circuit court of appeals for the seventh circuit, begun and held at the United States court-rooms, in the city of Chicago, in said seventh circuit, on the second day of October, 1900, in the October term in the year of our Lord one thousand nine hundred, and of our Independence the one hundred and twenty-fifth year.

1721

Fig. 1.



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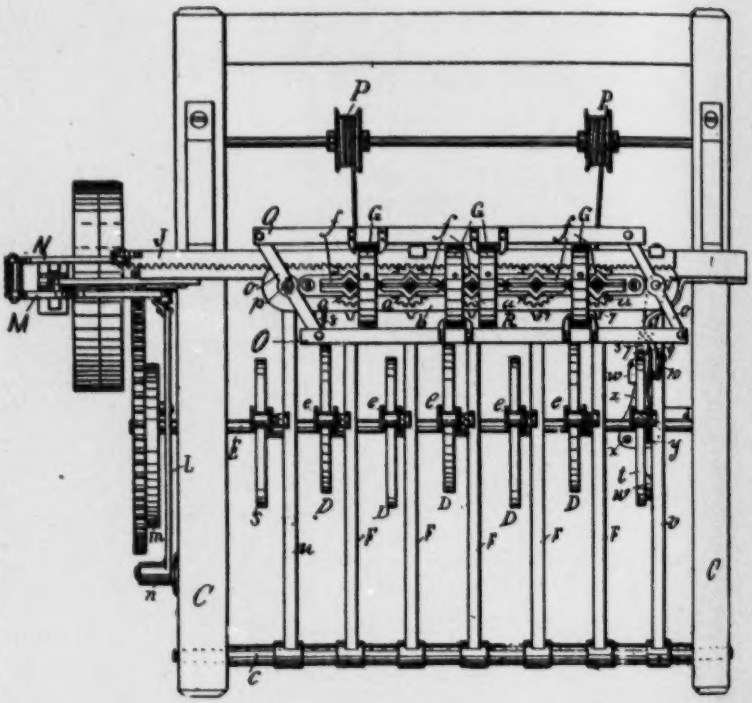

Fig. 2.

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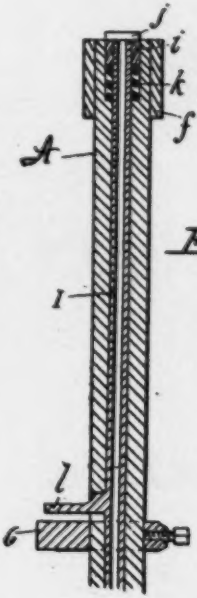

Fig. 6.

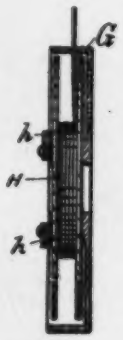

Fig. 10.

And afterwards, to wit: on the ninth day of April, 1901, in the October term last aforesaid, the following further proceedings were had and entered of record, to wit:

TUESDAY, *April* 9, 1901.

Court met pursuant to adjournment.

Present: Hon. William A. Woods, circuit judge, presiding; Hon. James G. Jenkins, circuit judge; Hon. Peter S. Grosscup, circuit judge.

ALVA L. KITSELMAN and DAVIS M. Kitselman *vs.* KOKOMO FENCE MACHINE COMPANY, Jesse M. Srofe, Harry Ward, John E. Frederick, Kittie Srofe, George W. Frederick, and Joel Ward.	647. Appeal from the Circuit Court of the United States for the District of Indiana.

Now again this cause comes on be considered on the opinion of the judges before whom it was heard, which opinion is as follows:

813 In the United States Circuit Court of Appeals for the Seventh Circuit, May Session, A. D. 1901.

ALVA L. KITSELMAN and DAVIS M. KITSELMAN, Appellants, *vs.* KOKOMO FENCE MACHINE COMPANY, JESSE H. SROFE, Harry Ward, John E. Frederick, Kittie Srofe, George W. Frederick, and Joel Ward, Appellees.	No. 647.

Appeal from the circuit court of the United States, district of Indiana.

Before Woods and Grosscup, circuit judges, and Seaman, district judge

In the suit below the appellants alleged infringement of four patents, under which they are manufacturing a machine for weaving wire fence *in situ*. These are, letters patent No. 289,507, granted W. J. Davisson, December 4, 1883, and later assigned to appellants; letters patent No. 356,322, granted A. L. Kitselman, one of the appellants, January 18, 1887; letters patent No. 357,067, granted T. M. Connor, February 1, 1887, and subsequently assigned to appellants; and letters patent No. 505,607, granted appellants as assignees of John C. Pope, September 26, 1893. The particular claims charged to be infringed are the second and third of the Davisson patent; the first, second, ninth, tenth, eleventh, fifteenth and twentieth of
814 the Kitselman patent; the second and third of the Connor patent; and the first, ninth and tenth of the Pope patent.

Figures 1 and 2 of the Davisson patent—one of the four in suit, and referred to in the opinion—will serve to show the twisting spindles and wire reels in position for operation; figure 6 is an enlarged sectional view of the twisting spindles; and figure 10 a vertical section of a reel case and a wire reel in position thereon. They are as follows:

(Here follow diagrams marked pp. 814, 815, & 816.)

816 The specifications of the Davisson patent are as follows:

"A series of hollow vertical spindles, A A, having their ends journaled in vertical sliding bearings B B, are mounted on a suitable main frame C C. Each of said spindles is provided at its upper end with a cogged pinion, *a*, which is provided with a projecting cylindrical hub having a bearing in a plate, *b*, secured to frame C. Pinions *a* are each provided with a square central perforation, and the upper end of each of the spindles is squared and fitted to slide freely through said perforation, the purpose being to revolve the spindle by means of the pinion, and to allow a vertical movement of the spindle through the pinion. Each spindle A is given an intermittent reciprocating motion by means of a cam, D, mounted on the driving shaft E, and a lever, F, pivoted at one end to a rod, *c*, extending across from one side of the main frame to the other, and connected at the free end with the sliding bearing B by means of a short link, *d*. A friction roller, *e*, is adjustably secured to lever F over cam D, there being a cam and a lever for each spindle. Cams D are placed alternately on the driving shaft, with their flat faces on opposite sides of the shaft and their high portions overlapping, so that at each half-revolution of the driving shaft each alternate spindle is raised, as seen in Fig. 1; but on account
817 of the overlapping of the high portions of the cams there are two points in each revolution where the spindles are all at their highest point at the same time, for a purpose hereinafter explained. Across the top of each spindle is secured a square cross-bar, *f*.

"G G G G are cylindrical cases formed of sheet metal, having a central hub, *g*, which has a square central hole which fits over, and is adapted to slide upon the cross-bars *f*. The cases G are open on one side, and each carries with it a reel, H, which is adapted to turn on hub *g*. The wire for forming the meshes of the fabric is wound upon said reels, and they are prevented from slipping off the hub by turn-buttons *h h*, all as clearly shown in Fig. 10.

"For the purpose of preventing the wire reels and their cases from being thrown off from the ends of cross-bars *f*, a narrow bar, *i*, having upturned ends *j j*, Fig. 6, is placed in a groove in the top edge of cross-bars *f*, said groove being of such depth that the upturned ends of bar *i* may be drawn down flush with the top surface of *f*. Said cross-bar *f* is centrally secured to the upper end of a tube, I, which slides in spindle A. The interior of spindle A is enlarged at the top to receive a spiral spring, *k*, which surrounds tube I and forces the upturned ends of bar *i* above the surface of *f*. A pin, *l*, fastened to the exterior of tube I, projects through a slot in the side of the spindle and stops the upward movement of the tube and the bar *i*.

"J is a rack-bar engaging pinions *a a*, and adapted to slide forward and backward endwise, and to revolve said pinions and their respective spindles alternately in opposite directions. Rack-bar J is reciprocated by means of a grooved cam, *m*, on one side of the driving wheel, (shown clearly in Fig. 5,) a lever, L, pivoted to the main frame at *n*, and having a pin projecting into grooved cam *m*,

a bell crank, M, to the short arm of which the free end of lever L is connected, and a rod, N, pivoted to the end of the rack-bar and adjustably connected to the long arm of lever M.

"O O are shipper bars for shifting the wire reels from one set of spindles to another. Said bars are pivoted at their ends to cross-heads *o o*, and said cross-heads are rigidly secured at their centers to two upright shafts, *p r*, which shafts are raised twice in each revolution of the driving shaft by means of cams *s* and *t*, secured on the driving shaft, and levers *u* and *v*, pivoted at one end to the rod *e*, and connected at the other end with shafts *p* and *r*. Shaft *r*, after being raised, is given a partial revolution by means of cam-shaped projections *w w* on the side of cam *t*, Fig. 2. Said projections engage alternately pins *x y* on a lever, *z*, the opposite end of which is forked, and engages a rod, 1, secured to shaft *r* by means of two short arms, 2 and 3.

818 "P P are reels carrying the wires for forming the edges of the fabric. 45 are guides for said wires.

"For the purpose of holding spindles A in position, I secure upon each spindle a dog, 6, and provide a catch-plate, R, which plate is provided with notches 7, adapted to fit over said dogs. Said plate is attached to short arms 8, 9, which are pivoted to brackets attached to the main frame. Arm 9 is extended outward beyond its pivot, and is connected with lever *v* by a rod, 10, the effect being, when said lever is raised, to throw plate R downward and engage the dogs on the spindles.

"For the purpose of taking up the finished fabric, rolls S T are mounted on shafts journaled in the main frame. The bearings of roll T are movable, and the surfaces of the rolls are held in close contact with the fabric by means of a spring, 11, at each end of roll T. A reel, U, for storing the finished fabric, lies in the slotted bearings on the supports rising from the main frame. One turn of the fabric having been taken about said reel and secured thereto, the reel is thereafter revolved by frictional contact with roll T, on which it rests. Roll S is revolved intermittently by means of a ratchet-wheel, 12, secured to its shaft, a pawl, 13, and a rod, 14, connected to shaft *p*.

"The operation of my machine is as follows: The wire from reels P P is carried upward through the outside spindles, A A; or, if a narrower fabric is desired, it may be carried through either of the other spindles, and four of the incased reels carrying wire for forming the meshes are placed on alternate spindles, as shown in Fig. 1. The wire is led from each of these reels through an opening in the case, and all of the wires are passed between take-up rolls S T and passed once around reel H, and there secured. Power is now applied to the driving shaft E, and as it revolves rack J is thrown forward and the spindles A are revolved, making two complete revolutions, and thereby twisting together the wires on the opposite ends of the cross-bar *f* on the central spindle and passing the wires on the cross-bars of the outside spindles around the straight wires from reels P P. When these revolutions have been accomplished, the intermediate spindles carrying no reels have been raised by their respective

cams D and levers F to the level of the spindles carrying the wires, and catch-plate R has engaged dogs 6, at the same time depressing bars *i* by striking pins *l* downward. At the same time the shafts *p r* have been raised by cams *s t* and levers *u v*, carrying upward the shipper bars O O till they are level with the cross-bars *f*, which are now all in line, and the forks of the shipper bars embrace between them the reel cases G. The cam projection *w* on one
819 end of cam *t* now passes between pins *x y*, engaging *y*, and lever *z*, being thereby vibrated and engaging rod 1, partially revolves shaft *r*, by this means moving the shipper bars O O endwise, and thereby shifting the cases G and their reels to the intermediate cross-bars, *f*, which before carried no reels. The spindles first carrying the reels now fall, and those now carrying the reels are revolved by the return of rack J to its first position and a new series of meshes formed. At each upward movement of the upright shaft *p* pawl 13 engages ratchet wheel 12, and the finished fabric is drawn upward and wound upon reel U.

"When short sections of fabric are to be made—as for gates—straight rods may be substituted for the side wires and the expansible reel removed."

The claims of the above patent relied upon as infringed are the second and third, and appear below:

"2. In a machine for making wire fabric, a series of spindles arranged in a line and mounted in bearings on a suitable supporting frame, and having on each spindle a cross-head carrying reels for wire on opposite sides of the axis of said spindle, substantially as specified.

"3. In a machine for making wire fabric, two or more hollow spindles adapted to admit the passage through their axis of wires forming the edges of the fabric, and having on each spindle a cross-head carrying reels for wire on opposite sides of the axis of said spindle, substantially as specified."

The pertinent drawings and specifications of the Kitselman patent are as follows:

(Here follow diagrams marked pp. 820, 821, & 822.)

Fig. 1

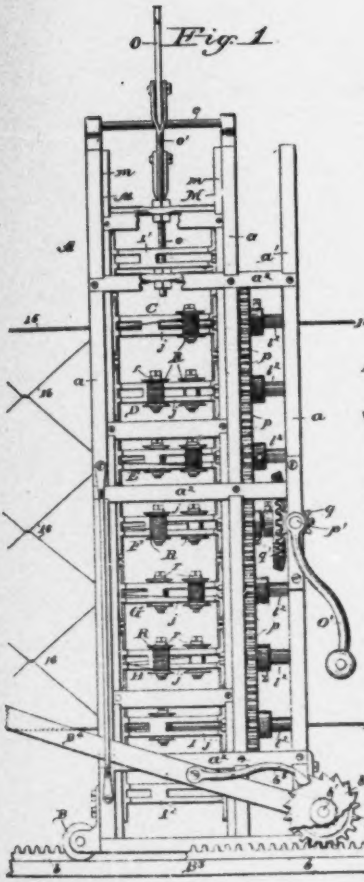

Fig. 2.

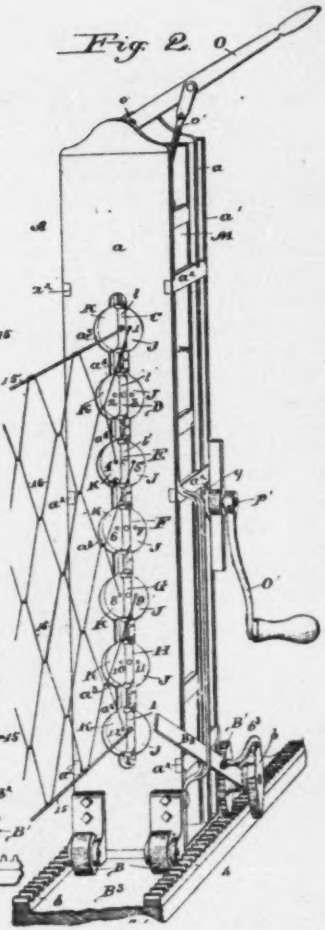

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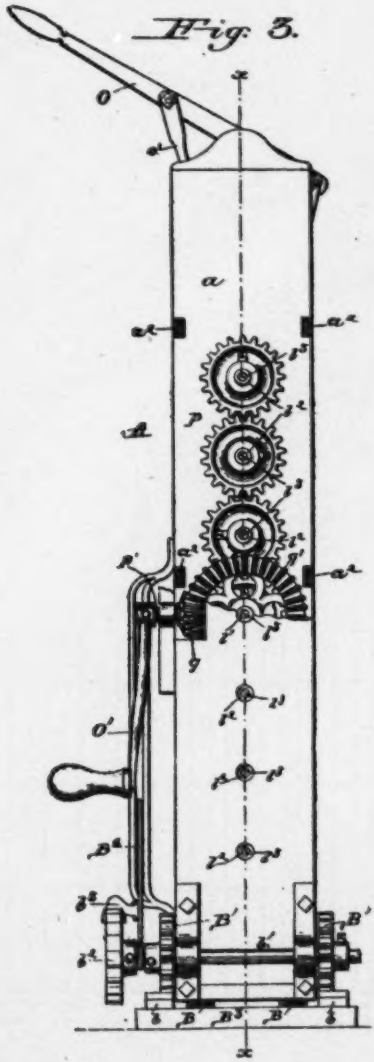
Fig. 3.



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Kitselman
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Norris &
Kirkman

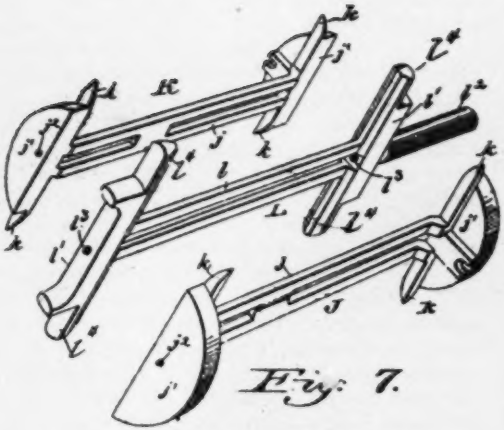
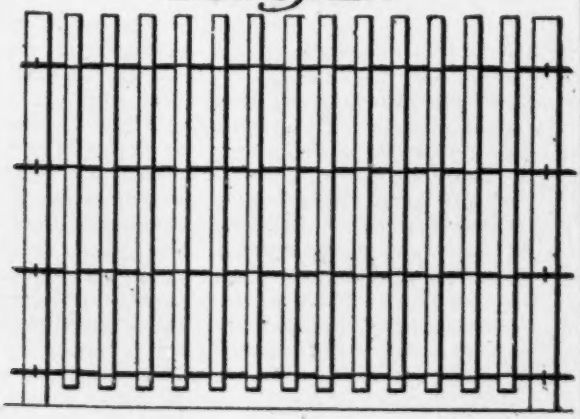
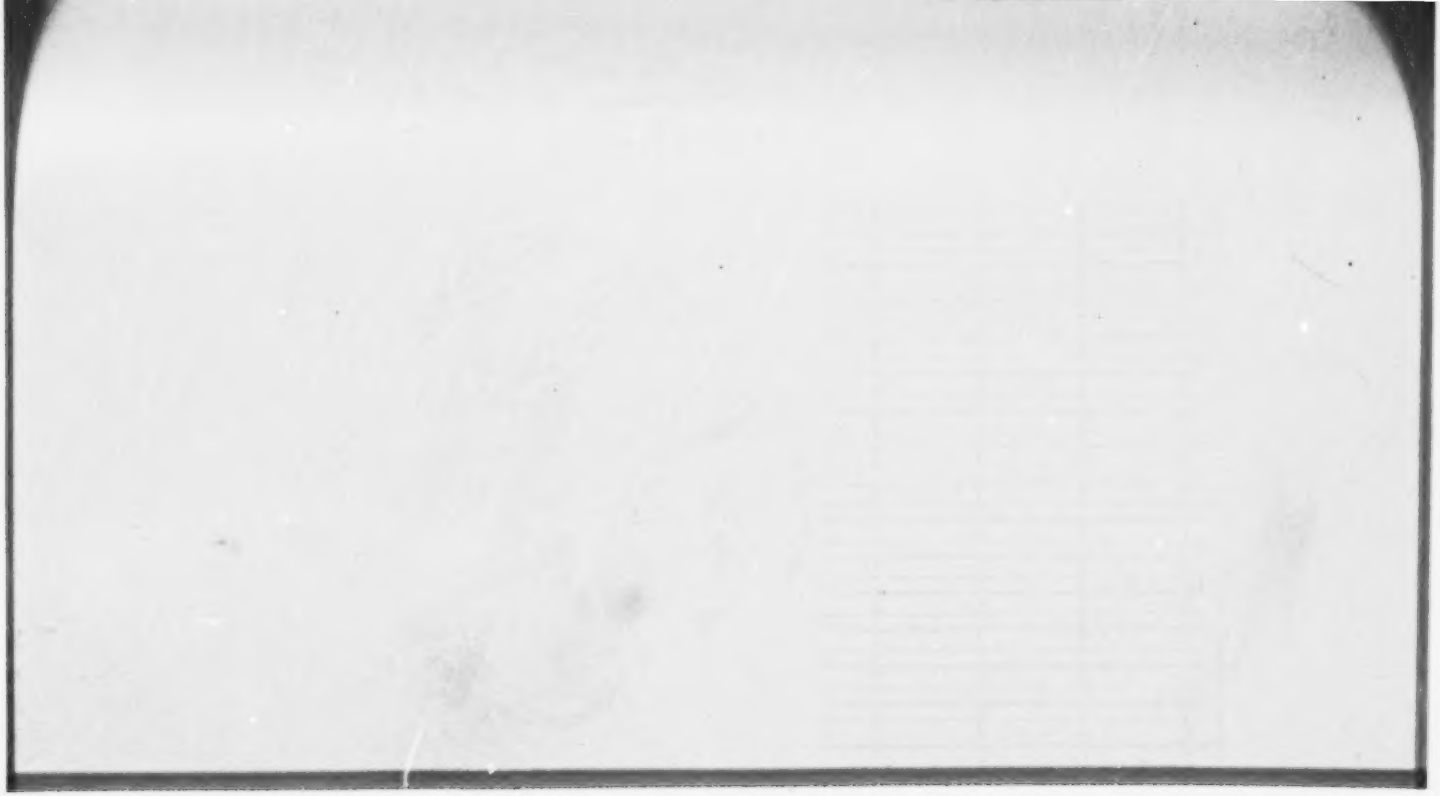


Fig. 7.

Fig. 19.





822 "Referring to the drawings, in which like letters of reference denote corresponding parts in all the figures, A designates the main frame or casing of my improved wire-fabric machine.

"When the apparatus is to be constructed in portable form, so that it is adapted for use in the open field, road, or other place for putting up or constructing fences as the fabric is turned out or manufactured by the same, the carrying frame A comprises the vertical standards or uprights *a a* and *a'* which are arranged parallel with each other and connected and braced by suitable cross or
823 transverse pieces, a^2; but the shape of this frame is immaterial, and I would have it understood that I hold myself at liberty to vary and change the same as may be desired.

"When the machine is to be transported and used in the open field, it is mounted upon supporting rollers or wheels B and B', which are arranged in pairs at the front and rear ends thereof, respectively. The front rollers or wheels, B, are provided with smooth or plane peripheries and travel on the smooth surface of a board or other suitable track, B^3, that is placed on the ground or other place, and the rollers B' are provided with teeth on their peripheries, as clearly shown in the drawings, the said toothed wheels meshing with the racks *b*, that are arranged at the sides of the board or track B^3 and rigidly affixed or secured thereto in any suitable manner. The toothed wheels mesh with the toothed surface of the track, so that when they are rotated by the means which I will presently describe the main frame and the various parts of the operating mechanisms will be drawn along and thus fed at the required or proper rate, and the wheels B, with the smooth peripheries, are arranged comparatively close together, so that they will bear on the track between the racks or toothed surfaces at the sides of the latter, whereby the frame is rendered very steady in its movement.

"The toothed supporting wheels are rigidly affixed in any situable manner to a common shaft *b'*, so as to rotate or turn therewith, and this shaft is journaled in suitable bearings on the main frame at the lower rear side thereof. One of the ends of this shaft *b'* is extended beyond the sides of the vertical main frame, and to this extended end is rigidly affixed a ratchet wheel b^3, with the teeth of which engages the pointed or free end of a pawl, b^3, that is pivoted on and carried by a hand or operating lever, B^4, which is provided with an eye or opening at one end, through which the shaft is passed, so that the lever is supported on the shaft and free to move thereon independently of the same. This ratchet mechanism is designed to be operated by hand to feed the frame and other parts of the mechanism along to any required distance; but I do not intend to restrict myself to the peculiar construction and arrangement of the parts of the same, as they can be varied without departing from the spirit of my invention.

"The distance which the main frame can be moved can be easily and readily regulated or varied by the operator by causing the pawl of the hand lever to slip over two, three, or more teeth of the ratchet wheel, so that the mesh of the wire fabric or fence can be made of

uniform size or varied as may be necessary, according to the design of fabric selected, as will be very readily understood.

824 "The main frame A carries a series of devices for twisting the wire into open spaces or loops, and, for the sake of clearness and convenience, in describing or referring to these devices hereinafter I will term them as 'twisters.' Any preferred or desired number of these twisting devices may be employed that may be deemed desirable or necessary, and in the accompanying drawings I have shown a series of seven, and will confine my description of the operation of the machine to this number of these devices; but I would have it understood that I hold myself at liberty to vary and change the number thereof to adapt the machine to manufacturing wire fabric of any desired width, or to constructing fences of varying or different heights.

"In order to render the operation of my machine more clear and explicit, I have lettered these twisters C D E F G H I. The twisters from C to I, inclusive, form the active twisters, and at the top and bottom I provide two in active twisters, I' I^2; and in describing the process of manufacturing the different classes or kinds of fabric I will describe the method or manner of threading the twisters, and also in which the fabric is formed. Each of these active twisters consists, essentially, of two oppositely movable sections, J and K, and a stationary section, L, these terms being used for the purpose of distinguishing the parts of the twisters. In Fig. 7 of the drawings I have shown one of these active twisters with the parts detached from each other, and will now describe the said parts separately from each other. The oppositely movable sections J K of each of the active twisters are made precisely or substantially alike, and they each consist of a tie or connecting bar, *j*, and two segmental heads, *j'*, which are formed integral with the tie-bar and at the extremities of the latter. These segmental heads of the movable sections of the twisters are placed on opposite sides of the stationary sections of the twisters, so that the flat sides of the said segmental heads of the movable sections impinge or bear against the stationary section on their flat or straight sides and their outer curved edges form a complete circle, whereby the stationary and movable sections of the twisters are adapted to impinge upon each other and to revolve together, so as to form the twist in the loop during the process of manufacturing the fabric.

"As before stated, each of the movable sections of each twister is cast or formed in a single piece of metal, and the segmental heads *j'* of the twister sections are each provided with a transverse aperture or opening, j^2, except one of the movable sections of the upper and lower twisters, C I, respectively, for the free passage of the wire, as more fully described presently, and said heads are further provided with radial or outwardly projecting arms or ribs *k*, which

825 impinge or bear against the sliding frames to prevent longitudinal play of the same. These arms are also formed or cast with the twister sections, and they are arranged to project beyond the periphery of the segmental heads, and at or near the straight inner side thereof, for the purpose described.

"The stationary or immovable section L of each twister consists of a tie or connecting bar, l, and the flat heads or ends l', formed or cast in a single piece therewith at opposite extremities of the tie or connecting bar, the heads or ends of the tie-bar being made of the same thickness or width as the bar itself, so that the sides of the tie-bar and heads thereof are in line with each other. The extremities of the heads l' of the central stationary section of each twister are extended beyond the upper and lower sides of the tie or connecting bar, as at l^4, so that when the said central section is rotated with the side sections of the twister to form the twist in the loop the extended ends l^4, will impinge upon the inner sides of the main carrying frame, and thereby prevent the central section from longitudinal movement. The stationary section of each twister has a cylindrical shaft or bearing piece, l^2, cast in a single piece therewith, and this shaft is arranged at the rear end of the section and projects outwardly beyond one of the heads thereof, as shown, the shaft and the heads of the tie-bar being provided with passages or openings l^3, which are in line with each other, so that the warp wires of the fabric or fence can pass through the said openings very freely without hinderance or danger of becoming entangled with other parts of the apparatus.

"The inactive twisters I and I' are arranged at the upper and lower ends of the main frame and on the opposite sides of the central sections of the active twisters, and said inactive twisters are merely fitted in and carried by the sliding frames to coincide with the central sections of the active twisters C I; but they do not affect the operation of the machine.

"M and N designate the sliding frames, which are arranged within the uprights a a of the main frame A and on opposite sides of the twisters. These sliding frames each consist of two vertical pieces, m, which are connected by suitable transverse pieces to render the frame rigid and strong, and which bear against the inner sides of the uprights a of the main frame. The upright a at the front of the main frame and the uprights m of each of the sliding frames are each provided with an opening or aperture, a^3 and m', respectively, the opening a^3 of the main frame being circular, and the openings m' of the sliding frames are formed on the inner edges of the sliding frames and semicircular, so that when the sliding frames coincide the said openings or recesses m' register to form a complete circle, and
826 these openings a^3 in the front uprights a, of the main frame are connected by vertical slots or passages a^4, and a space, m^2, is left between the contiguous edges of the sliding frames for the stationary sections L, as will be very readily understood. The openings a^3 and m' of the main and sliding frames are adapted to register or coincide, and they are equal in diameter to the diameter of the circle formed by the semicircular heads or disks at the ends of the movable sections of the twisters. It will thus be seen that I provide one of the uprights of the main frame and both uprights of the sliding frames with a series of circular openings, which are connected by intermediate spaces or slots, and that these openings and slots or spaces are arranged one above the other in vertical lines.

The circular openings in the said main and sliding frames correspond in number with the number of twisters employed.

"The twisters are arranged in series one above the other, and the stationary section of each of the twisters is fitted between the contiguous edges of the sliding frames and located between the movable sections of the twisters, which are thus disposed on opposite sides of the stationary section. The central stationary sections of all of the twisters are arranged in a vertical line, and they are fitted or so arranged that the heads of the extremities thereof are fitted in the straight slots or spaces *m'* intermediate of the semicircular openings in the contiguous edges of the vertically sliding frames, the shaft of the stationary section of the twister being passed through and suitably journaled in the rear uprights, *a* and *a'*, of the main frame, so that the stationary section of the twister is prevented from movement or play in a vertical line. The segmental heads at the extremities of the movable section of each twister are fitted so as to rotate very freely in the opening *m'* in the sliding frame, and the straight faces of the heads of the movable sections and the tie or connecting bars thereof are normally in contact with the head and tie bar, respectively, of the corresponding stationary or central section of the twister, whereby all three of the sections of each of the twisters are adapted to be rotated in vertical planes together or simultaneously for the purpose of forming the twist in one of the loops of the fabric, all of the said series of twisters being geared together to adapt them to be rotated at one operation in order to twist the wires in the series of loops simultaneously.

"From the foregoing description, taken in connection with the drawings, it will be seen that the heads of each section of each twister are fitted in the opening or recess in one of the sliding frames M or N, and when these frames are moved vertically these movable sections of the twisters are carried or moved with their respective frames, so that they are caused to coincide or register with
827 a stationary central section of a twister above or beneath the section from which the movable section started before the sliding frame was shifted. Thus, for instance, when the sliding frame N is moved upwardly, the sections K of the twisters E and F are carried with it and caused to register with the stationary sections of the twisters D E, respectively, as will be very readily understood. The object of thus shifting or moving the sections J K of the twisters is to cause the wires that are fed therethrough to cross or incline, in order to prepare the wires for the subsequent operation of twisting them, which is accomplished by rotating the twisters one or more times, as may be desired, all as hereinafter more fully described.

"The sliding frames M N and the movable sections of the twisters carried thereby are operated or shifted vertically in opposite directions by a single movement of a single hand lever, O—that is, when the frame M is moved upwardly, the frame N will be forced downwardly; and *vice versa*. This hand lever O is journaled or fitted near one end on a central pin or shaft, *o*, that is rigidly supported in the upper end of the main frame A, and the said lever is con-

nected with the shifting or sliding frames by intermediate links o', which are pivotally connected with the lever and the frames, as is obvious.

"Each of the shafts of the central section, L, of each twister is provided with a spur-gear wheel, p, which is rigidly secured thereto, so as to rotate therewith, and these gear wheels are all of the same diameter and have the same number and proportion of teeth, so that all of the twisters are rotated at the same rate of speed and describe a complete circle or revolution in the same space of time. The gear wheels mesh with each other, so that all of the twisters are rotated simultaneously, and these gear wheels are operated at one time by a single crank, O', that is arranged at one side of the machine, and is secured on a shaft p', which is journaled in suitable bearings affixed to the upright a' of the main frame, the said shaft having a small bevel-gear wheel or pinion q, which meshes with a larger bevel-gear wheel, q', on one of the shafts of one of the stationary sections of one twister. It will be seen that by rotating the crank the motion thereof will be communicated to the shaft of one of the twisters through the bevel-gear wheel and pinion, and as all of these shafts are geared together the twisters are rotated simultaneously.

"The warp wires that compose the fabric are passed or threaded through the central section of the twisters through the aligned openings therein, and the woof wires of the wire fabric or fence are passed through the transverse perforations or openings in the semi-circular disk or head of the movable sections of the twisters.

828 "The warp wires are wound or coiled in bundles as they leave the factory, and they are unwound in rear of the machine and stretched for a suitable distance—say fifty rods—upon the posts in rear of the machine, and they serve as stays to aid in keeping the machine vertical, the said warp wires being passed through suitable openings in the upright a', thence through the shaft of the central stationary section of the twister, then through the aligned openings therein, and out of the opposite side of the machine through the circular openings in the upright a at the front of the main frame. The woof wires are coiled upon spools or bobbins R, that are loosely journaled in brackets r, which are affixed very rigidly to the outside of the movable side sections of the twisters by means of suitable bolts or screws, which are passed through the brackets, and the tie-bar of the movable section, each of the said movable sections of the twisters, except the inactive sections I I' and one of the movable sections of the twisters C I, being provided with a spool or bobbin, which is carried thereby and rotates therewith during the operation of twisting the wire b to form the loops. The wire from these spools or bobbins R is passed through the transverse opening in the head of the movable side sections of the twisters, and thence through the circular opening in the front upright, a, of the main frame. One of the movable sections of the twisters C and I at the extreme upper and lower ends of the machine, however, is not provided with the bobbins R for the woof wires, because when the shifting frames M N are moved vertically one section of one twister C and the section of the twister I on the opposite side of the stationary central

sections of all of the twisters will be thrown above and beneath the circular openings in the main frame, and hence it is impossible to pass or feed the woof wires through the said movable section of the twisters therein, and when the frames M N are shifted to one position the inactive sections I I′ are adjusted to register with the stationary sections L of the twisters C I, the inactive twisters being provided merely to properly rotate the twisters C I. The warp wires, however, are passed through the central stationary sections of the said twisters.

"In order to attain a clear understanding of the shifting of the movable side sections, J K, of the active twisters by the sliding frames M N, I shall designate the central stationary sections by the reference letters which distinguish the twisters from each other—as, for instance, C D E, &c.—and the movable side sections of the twisters by the numerals from 1 to 12, inclusive, as clearly shown in the end elevations.

"To make the style of fence shown in Fig. 1 of the drawings I proceed to thread the twisters as follows: The end twisters, 829 C I are threaded with the large wire, which is to form the warp, by passing it through the aligned openings in the central stationary part or section thereof, and the smaller-sized wires, that form the woof of the fabric, are then passed through the twister heads 1, 4, 5, 8, 9, and 12, and it will thus be seen that no wires are passed through the twister heads 2, 3, 6, 7, 10, and 11, and the inactive twisters I I′, and the blank sections of twisters C I. When using the machine to construct a fence in the field, one end of the large wires from the central section of twisters C I is attached to the fence post just beyond the machine. The large wires 15, which pass through the central sections of the upper and lower twisters C I, form the warp for the woven-wire netting or fabric, while the smaller wires, 16, which are inserted through the heads of the side movable sections of the twisters, form the weft or woof of the netting. The wires 15 should be stretched taut by means of suitable stretchers located any desired distance from or in rear of the machine; but I have not deemed it necessary that these stretchers shall be shown, as any device for accomplishing this end can be used. With the warp wires 15 arranged as shown and described to form the selvage of the wire netting or fabric, and the weft or woof wires arranged through the twister heads of the sections J K, to make the style of fence in Fig. 1, I proceed as follows: The lever O is pressed down to move the slide M downward and by the same movement force the sliding frame N upward, inasmuch as the slides move in opposite directions simultaneously. By moving the sliding frame N upward the side sections of the twisters that are located in the sliding frames are forced upward correspondingly, and the side sections J of the twisters in the sliding frame M are forced downward with the frame by the same movement of the lever. Thus the section 1 of the upper twister, C, which has one of the weft wires 16, will be carried down and brought on a line to coincide with the central section of the twister D. By the same vertical movement of the sliding frames M N the twister heads 5 and 9 are carried down opposite to the cen-

tral section, L, of the twisters F and H, and the twister heads 4, 8, and 12 are carried up opposite to the central sections of the twisters D, F, and H, one twister receiving one of the side sections from the adjoining twister and giving one of its own side sections to the said adjoining section. The blank inactive twisters I I′ are thus caused to register with the central section, L, of twisters C I and the blank sections of twisters C I are reversed, as is obvious. In this manner the side sections, J K, which have weft wires 16 passed through them, coincide with the twisters D, F, and H, which originally had the side sections without any weft wires. While the machine is
830 in this condition, with its weft wires all located at the twisters D F H, the crank O′ is turned, causing the rotating of all of the twisters simultaneously as they are geared together for instantaneous operation. The number of complete turns given to the twisters will regulate the number of twists which are made in the wires.

"As the twisters are geared together, one twister will turn in one direction and the adjacent twister will turn in the opposite or reverse direction; but at the same time each twister will make the proper twist on the two weft wires without interfering with each other.

"It will be understood that the throw or movement of the sliding frames M N is just sufficient to cause the side sections to align or coincide with the central section of the twisters above and beneath the same, according to the direction in which the side sections are moved by the sliding frames. In turning the twisters to make a complete twist, it is necessary to completely revolve the twisters—that is, transfer one side section from the sliding frame M to the sliding frame N, and then return it again to the frame M. This turning of the twisters is kept up to correspond with the number of twists to be made at the crossing of the wires. When the twisting is completed at this point, the sliding frames are shifted back to their original positions by properly manipulating the hand lever, thus returning the side sections, J K, to their proper central sections. The weft wires are now located as follows: The single weft wires at the twisters 1 and 12 extend alongside of the warp wires 15. The double weft wires at the twisters 4 5 and 8 9 are arranged on each side of their respective central sections, C E, and while in this position the crank is again turned to cause the rotation of the twisters and consequent twisting of the wires at the points designated. The single end weft wires twist around the warp wires and the double weft wires twist upon themselves or around each other. Having now reached the point from where the operation started, it is not necessary to continue further, since by repeating the operation over and over again the wires are inclined and twisted to form additional meshes or loops of the netting, as will be very readily understood. It will be plain that by the alternate shifting of the sliding frames M N up and down the weft wires are extended down and up in alternate series, and thus woven together to form the mesh when the twisters are rotated."

The claims of the Kitselman patent alleged to be infringed are the following:

"1. In a wire-fabric machine, a series of sectional twisters, each of which comprises a central section for carrying a warp wire, and having rotary movement imparted thereto, and the shifting
831 sections for carrying the weft wire, and receiving rotary motion from the central section to form the twist, substantially as and for the purpose herein described.

"2. In a wire-fabric machine, the combination of a series of sectional twisters geared together for simultaneous rotation, and each comprising a central portion movable only on its axis and side portions capable of a compound movement—that of rotation on their axes—and of a shifting longitudinal movement, substantially as described, for the purpose set forth.

"9. In a wire-fabric machine, the series of sectional twisters, comprising the central and side sections, the central section of each twister being geared to the twister adjacent thereto for simultaneous operation, substantially as described, for the purpose set forth.

"10. In a wire-fabric machine, the combination of a series of twisters geared directly together for simultaneous operation, and each comprising a central section and the side section, each side section carrying a spool or reel for the wire, substantially as described, for the purpose set forth.

"11. In a wire-fabric machine, a series of twisters connected for simultaneous operation, and each consisting of a central section and the side section, in combination with the spools carried by the side sections, the central section of each twister being provided with a longitudinal opening for the passage therethrough of the warp wire, substantially as described.

"15. In a wire-fabric machine, the combination of a series of rotary twisters geared directly together for simultaneous operation, each twister having a central section capable of rotary movement only, and two side sections which are capable of a shifting movement independently of the central section in opposite directions simultaneously, whereby the said shifting sections of one twister are adjusted to register with the central sections of twisters on opposite sides of the same, substantially as described, for the purpose set forth.

"20. In a wire-fabric machine, a series of sectional twisters, each comprising a central section, the central sections being geared together to be simultaneously rotated on their axes, and the shifting side sections adapted to align with the central sections to be rotated therewith, substantially as described, for the purpose set forth."

The view we have taken of this case makes it unnecessary to set out the drawings and specifications of the Connor and Pope patents.

Appellees construct their wire-fencing fabric as licensees under and pursuant to letters patent No. 552,025 granted W. D. Whitney December 24, 1895, the drawings and specifications of which are as follows:

(Here follow diagrams marked pp. 832, 833 & 834.)

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Fig. 1.

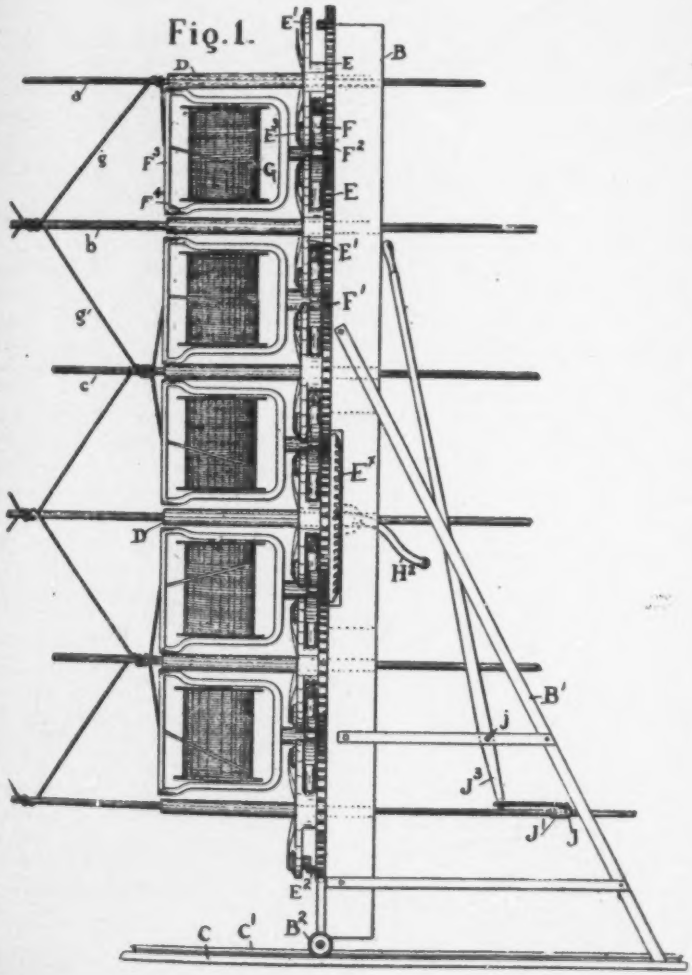

Fig. 2.

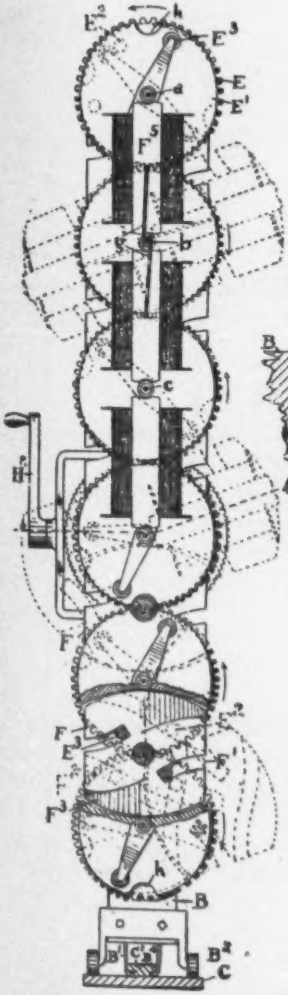

Fig. 5.

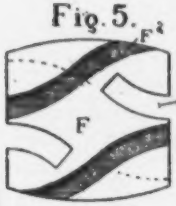

Fig. 3

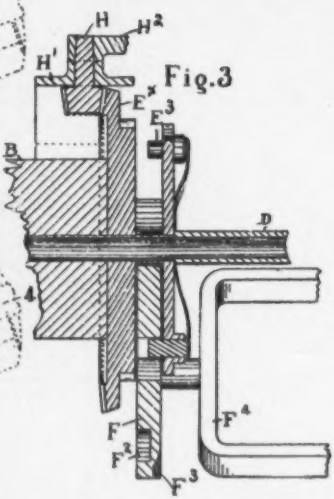

Fig. 6.

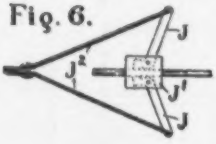

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Fig. 7.

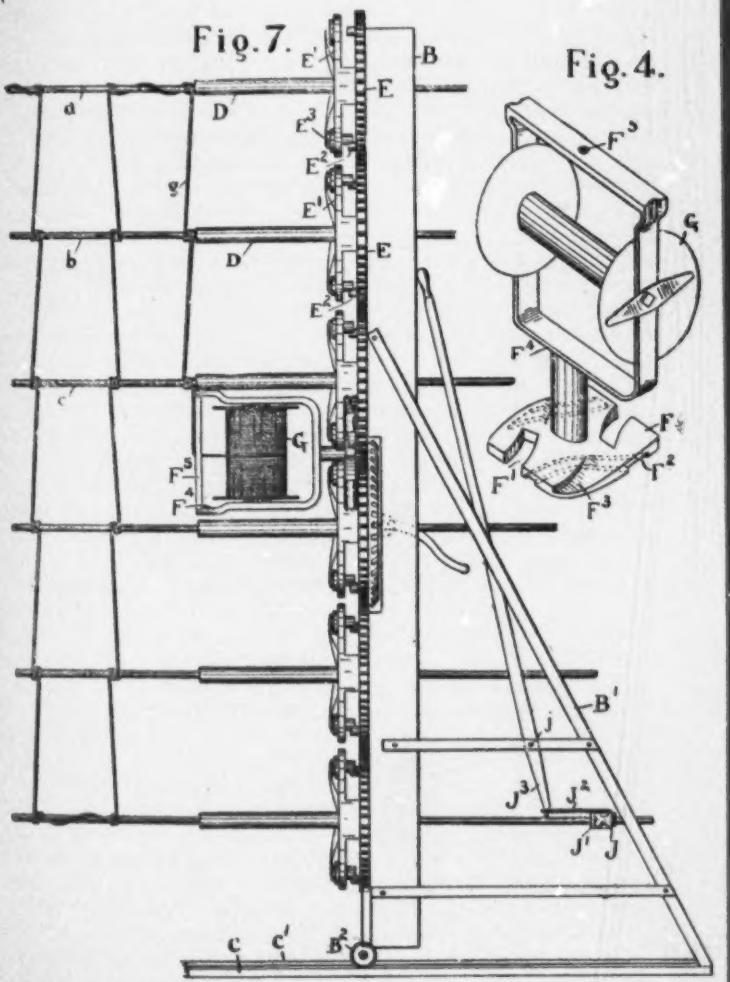


Fig. 4.

835 "In the present embodiment of my invention I have shown it applied to a traveling frame adapted for making, in the field, fencing having longitudinal strands of wires, said frame embodying an upright post B having suitable braces B′, and at its lower end supporting wheels B², resting upon a board or support C having a rib C′ grooved on opposite sides, into which grooves project the inwardly extending ends B⁴ of the braces B′. Passing through the post B, and at even distances apart, are tubes D, preferably extending at the front, as shown, and through these pass the longitudinal wires *a b c*, &c., of the fence or fabric, and upon them are loosely journaled rotary supports for the spool-carriers, said supports consisting, in the present instance, of intermeshing gears E having, at the front, plates E′, between which and the gears are recesses for the accommodation of the bottom plates F of the spool-carriers.

"E² indicate studs or bosses arranged in the recesses and projecting from the face of the gear, and E³ are latch-pins passing into the recesses through apertures in the plates E′ and pressed inward by springs E⁴, small heads on the latch-pins limiting their inward movement. The studs and latch-pins are arranged some distance apart, as shown, the former being arranged to co-operate with the curved grooves F² in the rear side of the plate F of the spool-carrier, and the latch-pins to co-operate with the incline F³ on the top of said plate and the curved slot F′ in one side thereof, the groove and slot crossing, as shown, and the relations of the parts being such that the spool-carrier is held by the latch and stud on the rotary support and may be rotated with it without danger of dropping out.

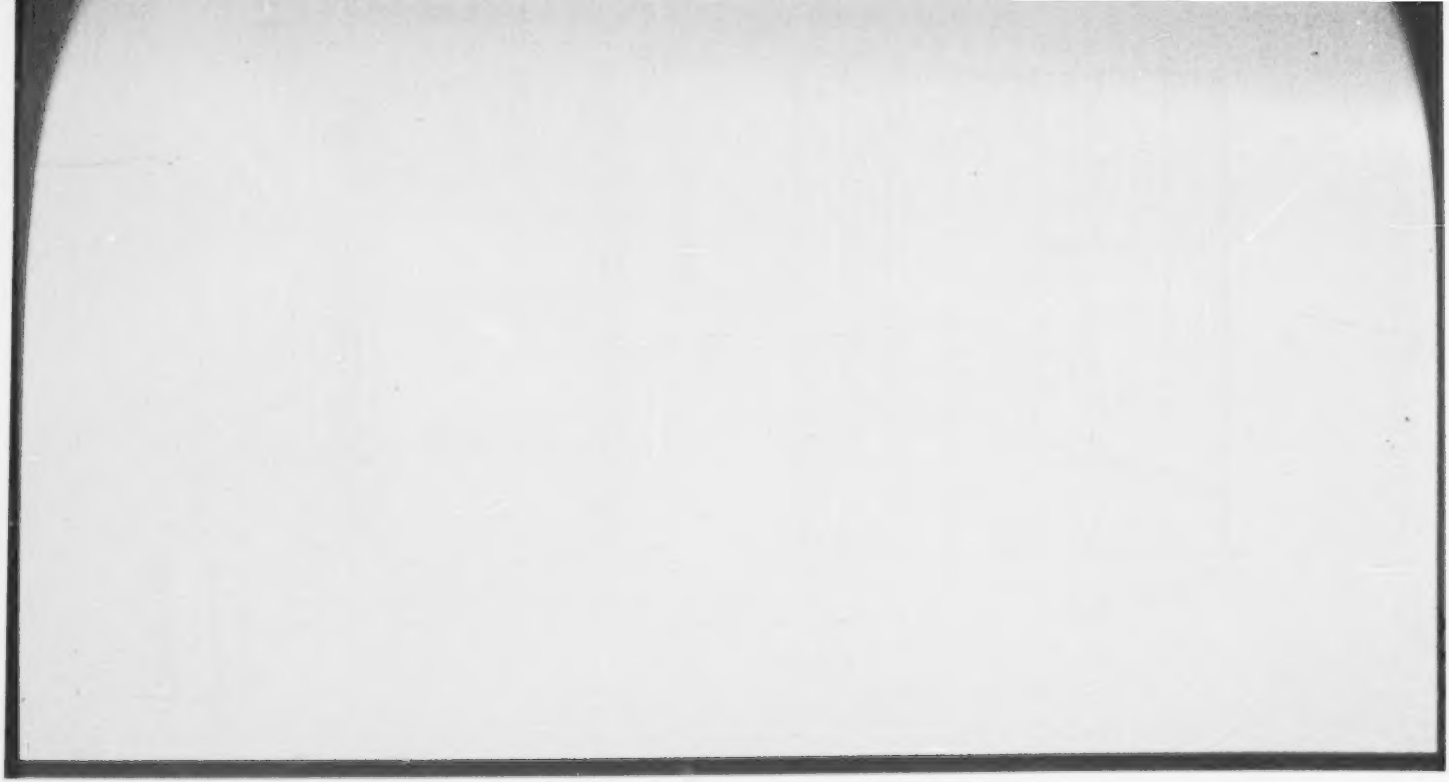
"Upon the outer sides of the plates F are the spools G containing the weft or filling wire *g* and mounted on a spindle in a suitable yoke frame F⁴ having the perforated cross-bar F⁵ through which the weft wire passes, any suitable brake or tension device being applied to the spool to prevent movement excepting when the wire is positively drawn off. The outer plates E′ of the rotary supports are preferably recessed at *h* for the accommodation of the standard of the spool-carrier, as shown in Fig. 2.

"The gears E intermesh and are adapted to be rotated in either direction by means of bevel-pinion H mounted on the frame H′ and having an attached handle or crank H², said pinion meshing with a corresponding bevel wheel E² formed upon or attached to one of the gears E, as shown in Fig. 3.

"The devices for moving the frame B after the wires are twisted consist of a clamp embodying jaws or levers J J, pivoted to a block or support J′ and adapted to grip one of the longitudinal wires of the fence or fabric, the outer ends of said jaws being con-
836 nected by links J² with the end of a lever J³ pivoted to the main frame at *j*. It will be seen that when the lever is moved in the direction indicated by the arrow in Fig. 1 the jaws J J will grip the wire and the machine will be moved, and upon moving the lever in the opposite direction the jaws will slip on the wire, the distance of movement of the frame depending on the movement of the lever, which is adjusted to the size of the mesh required.

"When making wire fabric or fence such as shown in Fig. 1, the longitudinal wires are first set up and held taut, being passed through

the tubular supports D. Then the filling wires *g* from the spools are secured to the end post or the longitudinal wires by twisting or in any suitable manner. For the purposes of illustration I will number the supports E from the top, calling the upper one 1, the next 2, and so on, and the upper longitudinal wire *a*, the next *b*, and so on. Starting from the position shown in Fig. 2, in which the slots and grooves in the spool-carriers are engaged by the pins and studs on the supports E, the machine may be operated to twist the filling wires together and around the wires *a c e* or *b d f*, as desired; but, assuming that the first twist is to be around the wires *b d f*, the supports E are rotated by the handle in the direction of the arrows, Fig. 2, and those numbered 2 4 6 will carry the spool-carriers F around, as in dotted lines, their latches E^3 co-operating with the sides of the slots F′ and the studs E^2 preventing the carriers dropping out. This operation is accomplished because the slots F′ in the spool-carrier plates F extend transversely of the path described by the latch-pins on the supports 2, 4 and 6 that are to move the spool-carriers, and substantially coincident with the path described by the latch-pins on the supports 1, 3 and 5 that are to rotate empty, the grooves F^2 being correspondingly arranged relative to the studs E^2 on the supports. This rotary movement is continued in the same direction as long as may be necessary to form the required number of twists around the wires *b*, *d* and *f*, (the weft or filling wires passing around the longitudinal wire *b* and *d* being of course twisted around each other also, while a single weft wire is passing around wire *f*). During the movement in this direction, as the carriers approach the position shown in full lines in Fig. 2, the latches E^3 on the supports indicated by 1, 3 and 5 ride up the inclines F^3 on the plate F of the spool-carriers and drop into the slots F′, and as long as the motion is in the direction indicated the carriers will be rotated as described and maintained in the supports indicated by 2, 4 and 6; but when it is desired to twist the weft wires around the longitudinal wires *a c e* it is only necessary to reverse the direction of movement of the supports E after said
837 supports have completed a full revolution, after the latches have dropped into the slots F′, and when the parts are in the position shown in Fig. 2 in full lines, and the operation of twisting the weft wires around wires *a c e* may be understood by assuming that the supports E are rotated in the opposite direction from that indicated by the arrows. Now, as before, the latch-pins E^3 of the supports 1, 3 and 5, that are to move the spool-carriers, describe a path transversely of the plane of the slots F′ in the carriers, and consequently move the carriers with them, while the latches E^3 on the supports 2, 4 and 6 ride up the inclines on the moving carriers, drop into the slots F′ and pass out as the carriers turn away from the supports. It will now be understood that the weaving of the fence can be readily accomplished by making the required number of twists around the longitudinal wires and then reversing the operating means, transferring the spool-carriers and twisting on the other wires in the opposite direction, thus dispensing with the transferring mechanisms heretofore deemed necessary and simplifying and lightening the machine.



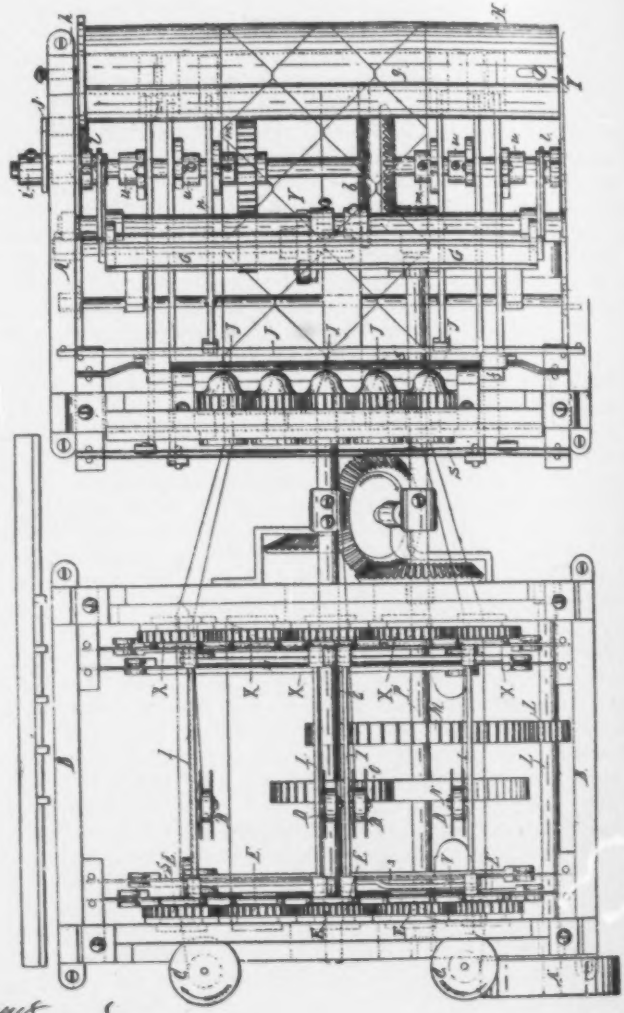


Fig 1.

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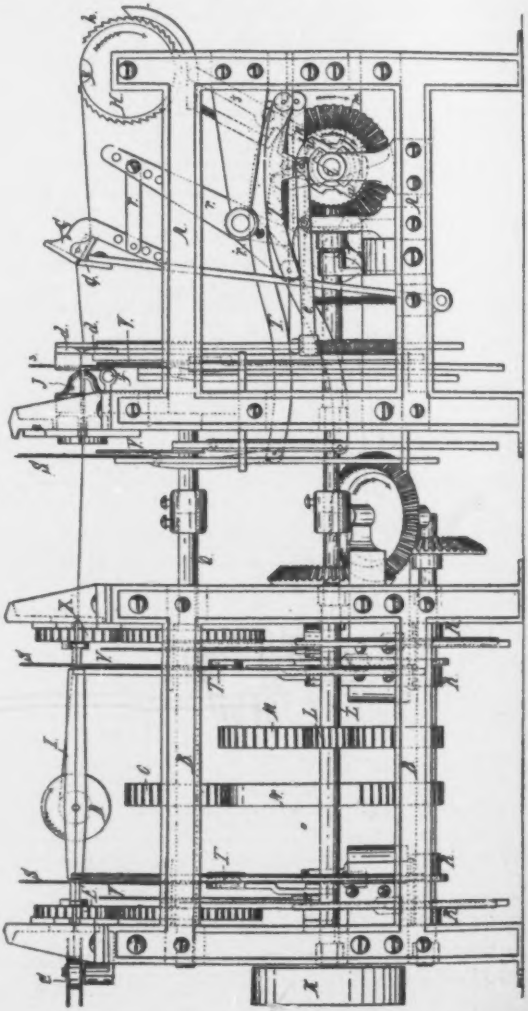

Fig 1.

"While the present embodiment of my invention is designed for building fences in the field, I do not wish to be confined to this arrangement, as wire netting or fabric could be readily made in quantity on large machines built for the purpose, the necessary relative movement of the fabric and machine being accomplished by moving the fence fabric instead of the machine, as herein.

"Although the spool-carriers are supported only at the lower end and at some distance from the spools themselves, it will be noted that the wires *g* draw from the aperture in the cross-piece F^5 to the longitudinal strand, in the direction of the length of said cross-piece, and that while the carriers are being transferred and are rotating the end of the cross-piece is against and turns about the tubular extensions D, as seen in Figs. 1 and 2, thereby preventing the carriers from dropping out.

"If it is desired to make a fence with square or rectangular meshes, as shown in Fig. 7, it may be accomplished by this machine by removing all of the spool-carriers excepting one, and causing the supports E to make one (or more) and a half complete turns around each longitudinal wire before the motion is reversed, causing the carrier to travel down. Then move the frame back, twisting the wire around the lower wire *f*, as shown, and when the carrier has made one or more complete turns, reverse the motion and it will be transferred to the next support E above, if the motion is reversed when the carrier is in engagement with the support to which it is to be transferred.

"The socket or recesses in the rotary carrier supports E and 838 the plate F, which in the present construction is the base of the spool-carrier is but one form of co-operating parts whereby the carriers are seated upon the rotary supports, and by the terms "co-operating projections" and "recesses," used in the claims, I wish to be understood as referring broadly to a means for seating the carriers on the supports in such manner that they may be retained by the latches when the rotation is in one direction, whether the recesses be in the support E and the ends of the plate F be the projections, as shown, or *vice versa*.

"As far as the operation of my device is concerned, it is immaterial whether the latches are placed on the supports or gears E or upon the carrier plates F so long as the relative movements of the latches, inclines and grooves are preserved. The slots F^4 and inclines F^3 on opposite sides of the spool-carrier plate in connection with the spring latches on the supports E constitute what I term a "reversed" latch connection between the parts—that is, one in which the transfer of the carrier from one support to the other is caused by the direction of the movement of the support relative to the carrier."

The essential drawings and specifications of letters patent No. 10,743, granted John Nesmith April 4, 1854, and referred to in the opinion as most adequately representing one branch of the prior art, are as follows:

(Here follow diagrams marked pp. 839 & 840.)

841 "The principal and main features of novelty of my invention consist in the principle of the revolving of the wires parallel to each other at the same time they are being twisted, and the other parts and movements of my machine to produce the effects hereinafter described.

"To carry out my invention and design fully, and first to manufacture my wire netting and wire-fence machines, it is the best plan, in my opinion, to construct the various parts of said machines of such materials as are hereinafter named. The frames should be of cast iron, also the cams, the stands, and gearing of the same material. The levers and shippers throughout should be of wrought iron. The jaws G G may be made of cast iron, to which must be attached pieces of steel where the same come in contact with the wires. The netting beam or cylinder H may be made of hard wood, with iron centers, and the ratchet gear on said cylinder may be of cast iron. The center part of the wire reels may be made of wood, with a sheet-iron rim on flange on each side.

"It will be readily understood by any good practical workman, by inspecting the inclosed drawings and specification, and following out the details described hereinafter, how to make, construct, and use my wire-netting machines. It is necessary to have machines for making every different size of the netting or fence—that is, for every different size of the meshes of the same—and any width of the netting less than the whole scope of the machine can be made by simply drawing in the number of wires desired, as will be understood hereinafter; and in proceeding to operate or use my netting machines it will be seen by examining the drawings that the same are composed of two parts connected together by two shafts, as seen at P and Q, Fig. 1, and one of the said parts I call the 'twister,' the frame of which is shown at A A, Fig. 2. The other part I call the 'feeder,' the frame of which can be seen at B B, Fig. 2.

"The border wire to netting and top and bottom wire in fence is usually larger than the wire to be twisted, although the wires can all be of the same size, if desired. The wire is placed upon the reels C C, Fig. 1, and then one end of the same is passed through a hole which is drilled in the center of the four outside gears, E E and X X, Fig. 1. The said wires are then passed to the twisting part of the machine, and through holes drilled in the centers of the two outside twisting gears, J J, Fig. 1. Then the said wire is passed between the jaws G G, Fig. 2, and then to the cylinder H, as seen at Figs. 1 and 2, and firmly secured to the same by a clamp, *g*, and a catch, *y*, which can be seen at Figs. 1 and 2, then the wires to be twisted, which are wound upon or around the reels

842 D D D D, Fig. 1. Said reels are then placed upon the stands I I I I, Figs. 1 and 2, on which they revolve as the wire is being drawn off from them. One end of the wire on each of the four reels D D D D is then passed through one end of the reel stands I I I I, Fig. 1, thence to and through the slots in the twisting gears J J J J, Fig. 1, and then they are passed between the jaws G G, Fig. 2, and thence to the cylinder H, Figs. 1 and 2, and secured to the

said cylinder by the same contrivance as the border wires, before described. The said wires being all adjusted, as above mentioned, the power is applied to the driving pulley K, Fig. 1, which is conveyed to the shafts P and Q, Fig. 1, by means of the shafts L and gears L and M, as seen at Fig. 1. The shippers S S S S, Figs. 1 and 2, being first raised by the cams R R and U U, Fig. 2, operating against or raising the levers T T, which are shown in Fig. 2, it being understood that the shippers S S in the twisting part of my machine act in concert with and simultaneously with the shippers S S in the feeding part of my machine. By this movement they are brought into the position as shown in Fig. 2 of the drawings, and then stop moving, and as soon as the movement of the said shippers ceases the twisting gears J J J J J, Fig. 1, and the feeding gears E E E E E and X X X X X, as seen at Fig. 1, make two revolutions, they revolving exactly with each other, so as to keep the wires parallel and from getting entangled with each other, two revolutions of the said gears being all the twisting that is necessary at each end of the meshes in the netting and fence for making good substantial work, although more or less twisting of the wire may be obtained, if desired, by altering the gearing in the following manner—viz., by enlarging the gear N, Fig. 1, if more than two revolutions are required of the said twisting and feeding gears, and by reducing the gear N, Fig. 1, if less than two revolutions are wanted in the said feeding and twisting gears at each end of the meshes in the netting.

"The before-mentioned gears J J J J J and E E E E E and X X X X X, after making two revolutions, as before stated, cease moving, which is effected by a part of the teeth of the gear N, Fig. 1, being cut off from its periphery, and as the said twisting and feed gears stop revolving in such position that the slots in the said gears are on a line with each other, so that the wires can be shipped from one set of gears to the others, by the shippers S S S S, Figs. 1, 2, and so that the wires can be shipped back from one set of gears to the others by the shippers V V V V, Figs. 1, 2, it being understood that the said feeding and twisting gears revolve and stop alternately—that is, they revolve when the shippers cease moving, and that the shippers perform their duty while the said gears remain motionless, and as the said gears stop re-
843 volving the jaws G G in the twisting part of my machine are moved backward nearly to the twisting gears J J J J J by the cam Y and arms and connecting pieces *r*, Fig. 2, and the spring *b*, Fig. 1, and by the peculiar construction of the upper jaw, G, and connecting pieces *r*, they (the said jaws G G, Fig. 2) are brought together upon the wire and then moved forward, or toward the cylinder H, one-half the length of the meshes of the netting, as will readily be understood by inspection of the drawings, and when the wire is so drawn forward and the jaws G G stop, then the shippers S S S S, Figs. 1, 2—that is, one of the two sets of shippers on each side of the feeder frame and one of the two sets of shippers, Fig. 1, on each side of the twisting gears—are first raised by the cams R and U, said shippers then remaining in this position until the wire is sufficiently twisted. Then they are depressed or moved down-

ward to their lowest position, as seen at V V V V, Fig. 2. Then the said sets of shippers V V V V, Fig. 2, on each side of the frame B and each side of the twisting gears J J J J are moved upward by the cams R and U by the same operation as the shippers S S S S, before described, and by the upward movement of the said shippers V V V V the wires are shipped from the position in which they were left by the shippers S S S S to the other feeding and twisting gears, as will be readily understood by inspection of the drawings—that is, one set of shippers move the four inside wires one way and the other set of shippers will move the four inside wires the other way at the required time to harmonize with the other correct movements of the machine. The two outside or border wires never move transversely, but move longitudinally, like the other wires, except that they pass through holes drilled in the center of the four outside feeding gears and the two outside twisting gears. The two outside small wires are wound twice around the border wires at every other twisting operation, as will be seen by inspection of Fig. 1.

"The reel stands I I I I, Fig. 1, have each a spring on the side next the reel, the object being to produce friction and to prevent the wire from coming off the reels too easily.

"The wire for netting, fencing, &c., should be well annealed. The necessity of this will be readily understood by practical workmen. The take-up motion to the cylinder H, Figs. 1 and 2, is composed of a ratchet gear, *h*, Fig. 1, and cam *i*, Fig. 1, and lever *j*, Fig. 1.

"At *f*, Fig. 2, is shown a shaft which supports a straight-edge, over which the wires travel as they pass through the machine.

"*d d*, Fig. 2, are two movable planes that are moved or brought together by means of the cams *l* and *m*, Fig. 1, and levers *e* and *n*, Fig. 1, the object of the said planes being to guide the wires when they are shipped, and to hold the wires firmly while they are being twisted, so that the wires may not be sprung where they are not twisted, and at the end of each twisting operation they (the said planes *d d*) open or move apart, but are together, as seen at *d d*, Fig. 1. On the top plane, *d*, there are five small vertical projections—one in the front of the center of each gear. These projections are to prevent the wire from being twisted too far into the meshes.

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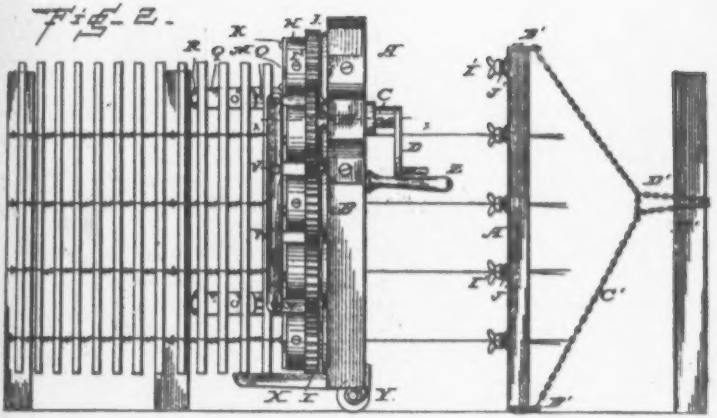
"By inspecting the drawings it will be seen that the jaws G G are made in such shape that as they are moved backward by the cam Y and arm *r*, the jaws are opened, and when they are moving forward they are brought in contact with the wire by shutting together, by which operation the said wire is moved from one twisting operation to another, and so on.

"It being understood that the take-up motion acts or operates at the right time, so as to keep the wire straight and smooth during the operation of the said machine, as hereinbefore set forth."

The Middaugh and Wilcox patent of December 23rd, 1884, is the best example of the second branch of the prior art; figure 2 of its drawings is set out below.

(Here follows diagram marked p. 844.)

Fig. 2.



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p. 244

845 The court below held that none of the appellants' patents possessed the quality of a pioneer invention; that neither appellants nor their assignors were the first to make a portable machine for weaving wire-fencing fabric in the field; that both appellants and appellees were on an equal footing, both being mere improvers upon the prior art; that in this view of construction to be put upon appellants' patents appellees did not infringe; and dismissed the bill for want of equity.

After the foregoing statement of facts, GROSSCUP, *circuit judge*, delivered the opinion of the court, as follows:

The decision of the circuit court turned upon the question whether the patents sued upon embodied a pioneer invention. We concur with that court in the opinion that if the invention was not of a primary character—a substantial departure from the machines of the previous art—the appellees' machine is so sufficiently differentiated from the patents sued upon that a claim of infringement cannot be maintained. But if, on the other hand, appellants' patents were the first to give to the world a workable, portable machine for weaving wire fences in the field—a machine distinctly creating a new product—and aptly embody in their specifications and claims the mechanical arrangements that bring about such a result, the decree below is erroneous.

To accurately comprehend the scope and merit of the appellants' inventions it is necessary to review the preceding art. This divides itself into two branches; that relating to loom machines, where the wire netting was made in the factory, and afterwards transferred to the field; and that relating to field machines, where the fence was constructed *in situ*.

The Middaugh and Wilcox machine was the most advanced of the field machines, and may be used as an illustration of the art in that direction. It was used to build a picket fence, the pickets of which were held in place by twists or weaves of parallel longitudinal wires. It employed mechanism that would give to such parallel wires the necessary twists, but did not involve a shifting, either of the wires or of the spools, such as is essential to the weaving of a diamond mesh. It did not, in fact, build a wire-mesh fence, but a wooden fence, with wire supports. It thus differs from the appellants' inventions, not only in the mechanism employed, but in the product turned out. The wooden picket fence, with its wire supports, is, in no just sense, a predecessor, in kind, of the diamond mesh-wire fence. Field machines of this character, therefore, must be dismissed, as not anticipatory of appellants' machines.

The two inventions in the loom-machine branch of the art,
846 most closely resembling the appellants' patents, are the Nesmith patent, and the William Smith (English) patent.

The Nesmith patent was taken out April 4, 1854, and seems to have remained unimproved upon until the Davisson patent, December 4, 1883. The patent is set out at large in the statement of facts, and there is no need, in this connection, of calling attention to the details, other than those connected with the mechanical means, gen-

erally speaking, whereby the twisting and the shifting, requisite to the weaving of the netting was brought about.

An examination of the model, drawings, and specifications shows that it contemplated but two border wires; though intermediate stay wires could have been provided, by the use of intermediate twisting heads with a hollow core. Each of the twisting heads—not only those carrying the border wires, but the ones intermediate—had radial slots through which were carried the feeding wires, being held in tension by appropriate mechanical means. A turning of these twisting heads carried the respective wires on their opposite sides around each other, and, at the borders, around the border wires, thus giving the necessary twists. This having been accomplished, the twisting heads were brought into position where the slots of each were directly opposite to the corresponding slot of the other, so that, by an appropriate shifting device, the feeding wires were carried into the opposite slots, and thus placed upon the opposite twisting heads. It thus happened that, when the twisting heads were again put in motion, the feeding wires were turned in a direction opposite to that of the previous turn; and, by repeated revolutions of this kind, the diamond mesh was woven.

Two distinctive features of this patent must be borne in mind: First, that the changes of the feeding wire, so that it would be rotated alternately in opposite directions, are brought about by the shifting of the wire, and not of the reels from which it is wound; and secondly, that there was necessitated a supplemental machine, whose office was, by a series of opposite revolutions, to keep the wire in the rear of the twisting heads from becoming itself twisted. These differences clearly dispose of the Nesmith patent as an anticipation.

The Smith patent is as readily disposed of. There is no proof that it ever built in the field a fence, and the description discloses nothing to differentiate it from the class of looms to which the Nesmith invention belongs; for, in speaking of the manipulation of the feeding wires, Smith says: "I apply to the lower part of the machine feeding bobbins, supplied with the wires or cables, which pass up to the work in suitable guides, and I cut a space out of the centre of one of the halves of the twisting wheels (which are always
847 made in two parts), so that my wires shall pass through; then when the divisions of the wheels are carried apart by the ordinary sliding bars my wires are pushed by guides out of the spaces in the wheels into slots in one of the sliding bars about midway between the turning wheels and on the opposite side of its half wheel, so that my wires may be held while the twist is made, and they are thus relieved from the action of the twisting wires which form the mesh. * * * *"

An examination of the appellants' patents will show that, beginning with the Davisson patent, the twisting of the wires was effected by mechanical means entirely different from those of Nesmith or Smith. Davisson dispensed with the supplemental mechanism necessary to the Nesmith machine, and, so far as we know, to all preceding loom machines, by substituting revolving reels for the stationary ones. Instead of passing the wires through the slotted twisting

heads (which necessitated the rear untwisting mechanism) Davisson projected forward from the revolving gear wheel spindles provided with a cross-head at their working ends adapted to alternately receive and discharge the reels from which the feeding wire was uncoiled. The revolution of these spindles, with the reels thus mounted upon them, rotated the reels in such manner as to twist the feeding wires around each other, and around the border wires. After as many such rotations as were needed to give the requisite twists, the reels, having been brought forward to a proper position, were shifted to the cross-heads of the adjacent spindles.

The two significant features of the Davisson invention are: That the diamond mesh is made by a shifting of the reels, instead of the wires; and that the supplemental untwisting mechanism is avoided. This was a distinct advance in the improvement of loom machines. By an ingenious mechanical change,—the substitution of shifting reels for mechanism shifting the wires—it reduced the loom machine from a complicated and bulky structure to a machine at once simple and effective.

But the Davisson machine, nevertheless, remained a loom machine. It was wholly inadaptable to use in the fields. It gave to the farmer no walking, workable diamond-mesh fence-maker.

What problem, then, did Kitselman, in 1887, have before him; what available material was at hand; and what did he accomplish? The most casual comparison shows, of course, that his machine—and especially its product—is essentially different from the fence-builders of the Middaugh and Wilcox design. It differs radically also from the Nesmith patent, in that interweaving is done by the shifting of the spools, instead of a clumsy shifting of the wires. Its near-
848 est kinsman is the Davisson patent; and, although the Davisson patent is owned by the appellants, it must, for the purpose of determining the scope of the Kitselman invention, be looked upon as an anticipation.

Kitselman utilized the Davisson hollow spindle, projecting forward of the rotating gear, with its cross-head and transferable spool-carriers thereon, for the purpose of twisting the intermeshing wire, and imbedding the longitudinal wires along the central line; but from this point he made an important departure—a departure that took the fence-builder practically from its belly, as a loom machine, and set it upon its feet as a walking, working field machine. It individualizes the passing of this art from its lower antecedents to its present state of comparative perfection.

The mechanical changes were simple, but the results were revolutionary. The spindles of the Davisson machine were arranged vertically; had, with reference to the Davisson machine, a longitudinal movement; and were alternately forced forward and withdrawn from the plane of operation by means of a shifting device that was necessarily bulky and impracticable for field use. The Kitselman spindles were horizontally placed; had no longitudinal or lateral movement; and were confined permanently to the plane of their rotation.

In the Davisson machine, as in the Kitselman, the spindle, with

its reels, acts as the twisting agent, the spindle forming the rotator; but in the Davisson machine the spindle, where the warp wire emerges from its hollow center, stands well back from the reels, thus allowing the warp wire to go unsupported to the plane of operation; while in the Kitselman machine the spindle extends clear forward to the twisting zone, to which it carries, through its hollow center, the warp wire fully supported against side pulls. In the Davisson machine the spool-carriers are transferred to their adjacent spindles by means of an apparatus previously described as involving a longitudinal and transverse motion. Kitselman effects the transfer of his spool-carriers by shifting the one to the spindle above the spindle with which it has just operated, and the other to the spindle below. This shifting, being brought about by a longitudinal motion only, thus eliminating the necessity of a transverse motion.

In the Davisson invention a simple gear is set behind each spindle, but none of these gears engage each other, so that, when the spool-carriers are shifted to adjacent spindles and cross-heads at each successive twist, they are revolved about a practically new center. Kitselman provided each twister at its central section with a spur gear of sufficient diameter to engage the gears of the adjacent twisters, and by this means imparted a simultaneous motion to the whole series of twisters. The gear arrangement of the Davis-
849 son machine tends to twist the opposing carriers out of alignment; subjects the central wire to certain deflection; and pulls the woof wires somewhat from their intended direction. In the Kitselman machine the pull, incident to the twisting operation, is constantly equalized, the central portions of the twisters offsetting each other in the plane in which the strain comes.

These distinctions are, to a certain extent, subsidiary, but nevertheless important. Their results entered into the general result, whereby the machine is taken from the ground, and effectively put upon its feet. The striking, effective change, however, is in the elimination from the Davisson machine of the transverse motion, (the transverse motion with reference to the Kitselman machine) and as a logical result, of the cumbrous machinery effectuating such transverse motion. The effect is as if each alternate spindle of the Davisson machine (those out of gear and standing back during the act of twisting) were eliminated, and the reels were transferred directly to and from the remaining adjacent spindles. It is this feature that gives opportunity for short spindles; that obviates the clumsy transverse adjustment; that, in short, compacts the machine within a space that permits its being set up upon its feet.

The Davisson machine could be put to no other use than that of a factory loom; it could not, in the very nature of its structure, be set up within a narrow compass. The Kitselman machine, by reason of the changes already pointed out, can be compactly mounted in a narrow vertical frame. The Davisson machine is, as we have already said, a fence-builder practically on its belly, with all the clumsiness and inertness of the lower species; the Kitselman invention, for the first time, put the fence-builder on its feet—an easy-

going, adaptable, working machine of the highest species. It built, for the first time, in the field, a wire-mesh fence. It became a farm implement—an implement before unknown—as much so as the first harvester or the first stump-puller. It turned over to the farmer in the field the work that had been previously done by the wire weaver in the shop. Out of it practically came a new product—a product as common now as the barbed fence, and probably much more useful.

The mechanical features distinguishing the Kitselman patent from the Davisson machine—and, of course, from all the preceding fence-builders—have been indicated with sufficient precision. The first, second, eleventh, and fifteenth claims of the patent, read in connection with the drawings and description, seems to us to adequately embody them. In construing a claim the whole specification is taken together, and if the terms in which the claim is stated are consistent with those of the description, the latter with its accompanying drawings is treated as an amplification and explanation of the former, illustrating and applying its more concise and definite expressions. *Robinson on Patents, section* 523.

Thus amplified by the description, the claims disclose a fence-builder which, for the first time, employing a series of sectional twisters different from any that preceded, gears these twisters together for simultaneous rotation (a conception not involved in the Davisson patent); and brings about the necessary shifting by a longitudinal movement, thus eliminating the Davisson transverse movement with its concomitant disadvantages—disadvantages fatal to the machine as a walking fence-builder. Kitselman disclosed to the world for the first time a practical means of supplying the farmer with a highly useful fence. He has set forth these means in detail, in the descriptive portion of his patent, and has framed the claims mentioned to correctly embody them as a mechanical unity. His work is the work of a primary inventor, certainly as much so as in the cases presented in *The Corn-planter patent*, 23 Wall. 181, and *The Barbed-wire patent*, 143 U. S., 275; and his letters patent are, therefore, entitled to a liberal construction.

A liberal construction, in our opinion, includes the appellees' machine. The latter is different in many features of mere mechanical structure; in the direction traversed by the spool-carriers; in the attachment of the spindles; in the mounting of the pinions; in the manner of supporting the spool-carriers, and in many other particulars—set out in the opinion below and in the argument of counsel. But all these subsidiary differences still leave the appellees' machine within the underlying structural conception—the mechanical individuality—of the Kitselman invention. They are changes here and there—oftentimes to its betterment—of the details, but they do not make the appellees' machine, any the less, the direct offspring of Kitselman's thought, and its mechanical embodiment. Within this view, appellees' machine constitutes an infringement.

The decree of the circuit court must be reversed and the cause re-

manded with directions to enter a decree in accordance with this opinion.

Woods, C. J., dissents.

A true copy.
Teste:

____ ____,
Clerk of the United States Circuit Court of Appeals for the Seventh Circuit.

851 On consideration whereof it is now ordered, adjudged and decreed by this court that the decree of the circuit court in this cause, be, and the same is hereby reversed with costs; and that this cause be and the same is hereby remanded to the said circuit court with directions to enter a decree in accordance with the opinion of this court.

And afterwards, on the same day, to wit: on the ninth day of April, 1901, in the October term last aforesaid, there was filed in the office of the clerk of this court the opinion of the court in the above-entitled cause.

(Opinion not inserted here as it is included in the decree of April 9, 1901.)

And afterwards, to wit: on the first day of May, 1901, in the October term last aforesaid, there was filed in the office of the clerk of this court a petition for rehearing in the above-entitled cause, said petition for rehearing being in the words and figures following, to wit:

United States Circuit Court of Appeals, Seventh Circuit.

ALVA L. KITSELMAN and DAVID M. Kitselman, Copartners as Kitselman Bros., Complainants, Appellants, *vs.* KOKOMO FENCE MACHINE COMPANY, Jesse H. Srofe, Harry Ward, John E. Frederick, Kitty Srofe, George W. Frederick, and Joel Ward, Defendants, Appellees.	No. 647. Appeal from the Circuit Court of the United States for the District of Indiana.

852 *Petition for Rehearing.*

To the Honorable William A. Woods, Peter S. Grosscup, and William H. Seaman, judges of said court:

The petition of The Kokomo Fence Machine Company on its own behalf and on behalf of its codefendants, the above-named appellees, humbly pray- that the decision heretofore announced in the above-

entitled cause may be vacated and set aside and a rehearing granted and reargument ordered in said cause. * * *

KOKOMO FENCE MACHINE COMPANY,
By JOHN E. FREDERICK,
Secretary and Treasurer.

Endorsed: Filed: May 1, 1901. Edward M. Holloway, clerk.

And afterwards, to wit: on the fifteenth day of May, 1901, the following further proceedings were had and entered of record, to wit:

WEDNESDAY, *May* 15, 1901.

Court met pursuant to adjournment.

Present: Hon. William A. Woods, circuit judge, presiding. Hon. James G. Jenkins, circuit judge. Hon. Peter S. Grosscup, circuit judge. Hon. William H. Seaman, district judge.

Before Hon. William A. Woods, circuit judge; Hon. Peter S. Grosscup, circuit judge; Hon. William H. Seaman, district judge.

853 ALVA L. KITSELMAN and DAVIS M. Kitselman, Copartners as Kitselman Bros.,
vs.
KOKOMO FENCE MACHINE COMPANY, Jesse H. Srofe, Harry Ward, John E. Frederick, Kittie Srofe, George W. Frederick, and Joel Ward.

647. Appeal from the Circuit Court of the United States for the District of Indiana.

Now again this cause comes on to be considered on petition for rehearing.

On consideration whereof it is ordered that the petition for rehearing be and the same is hereby overruled.

854 United States Circuit Court of Appeals for the Seventh Circuit.

I, Edward M. Holloway, clerk of the United States circuit court of appeals for the seventh circuit, do hereby certify that the foregoing typewritten and printed pages, numbered from 1 to 51, inclusive, contain a true copy of the papers filed (except briefs of counsel) and proceedings had thereon, in the United States circuit court of appeals for the seventh circuit in the case of Alva L. Kitselman and Davis M. Kitselman, copartners as Kitselman Bros., *vs.* Kokomo Fence Machine Company, Jesse H. Srofe, Harry Ward, John E. Frederick, Kittie Srofe, George W. Frederick and Joel Ward, No. 647, October term, 1899, as the same remains upon the files and records of the United States circuit court of appeals for the seventh circuit.

In testimony whereof I hereunto subscribe my name and affix the seal of said United States circuit court of appeals for the seventh

circuit, at the city of Chicago, this twenty-fifth day of May A. D. 1901.

{ Seal United States Circuit Court of Appeals, Seventh Circuit. }

EDWARD M. HOLLOWAY,
Clerk of the United States Circuit Court of Appeals for the Seventh Circuit.

855 UNITED STATES OF AMERICA, *ss:*

[Seal of the Supreme Court of the United States.]

The President of the United States of America to the honorable the judges of the United States circuit court of appeals for the seventh circuit, Greeting:

Being informed that there is now pending before you a suit in which Alva L. Kitselman and Davis M. Kitselman, copartners as Kitselman Bros., are appellants, and Kokomo Fence Machine Company *et al.*, are appellees, which suit was removed into the said circuit court of appeals by virtue of an appeal from the circuit court of the United States for the district of Indiana, and we, being willing for certain reasons that the said cause and the record and proceedings therein should be certified by the said circuit court of appeals and removed into the Supreme Court of the United States, do
856 hereby command you that you send without delay to the said Supreme Court, as aforesaid, the record and proceedings in said cause, so that the said Supreme Court may act thereon as of right and according to law ought to be done.

Witness the Honorable Melville W. Fuller, Chief Justice of the United States, the 4th day of November, in the year of our Lord one thousand nine hundred and one.

JAMES H. McKENNEY,
Clerk of the Supreme Court of the United States.

857 [Endorsed:] File No. 18,242. Supreme Court of the United States. No. 389, October term, 1901. Kokomo Fence Machine Co., *vs.* Alva L. Kitselman & Davis M. Kitselman. Copy deposited for the respondent in the office of the clerk of the United States circuit court of appeals for the seventh circuit. Writ of certiorari. Filed Nov. 16 1901 Edward M. Holloway, clerk.

In obedience to the command of the within writ, I herewith transmit to the Supreme Court of the United States, a true and correct copy of the record and all proceedings in the within-entitled case. As witness my hand and official seal this 16th day of November, A. D. one thousand nine hundred and one.

{ Seal United States Circuit Court of Appeals, Seventh Circuit. }

EDWARD M. HOLLOWAY,
Clerk of the United States Circuit Court of Appeals for the Seventh Circuit.

858 United States Circuit Court of Appeals for the Seventh Circuit, October Term, A. D. 1899.

ALVA L. KITSELMAN and DAVIS M. Kitselman, Copartners as Kitselman Bros., Complainants, Appellants,
vs.
KOKOMO FENCE MACHINE COMPANY, Jesse H. Srofe, Harry Ward, John E. Frederick, Kitty Srofe, George W. Frederick, and Joel Ward, Defendants, Appellees.

No. 647. Appeal from the Circuit Court of the United States for the District of Indiana.

It is stipulated by and between the parties hereto, by their respective counsel, that the certified copy of the transcript of record filed by the clerk of this court, in the Supreme Court of the United States in the application there made for a writ of certiorari in the above-entitled cause, there entitled Kokomo Fence Machine Company, petitioner, *vs.* Alva L. Kitselman and Davis M. Kitselman, respondents, No. 389, October term 1901, shall be taken as the return to said writ of certiorari granted by said Supreme Court in said cause on the 28th day of October, A. D., 1901.

Dated November 15, 1901.

ROBERT H. PARKINSON,
Counsel for Alva L. Kitselman and Davis M. Kitselman.
THOMAS A. BANNING,
EPHRAIM BANNING,
Counsel for Kokomo Fence Machine Co. et al.

Endorsed: Filed Nov. 16, 1901. Edward M. Holloway, clerk.

859 UNITED STATES OF AMERICA, *Seventh Circuit.*

In obedience to the command of the foregoing writ of certiorari and in pursuance of the stipulation of the parties, a full and true copy of which is hereto attached, I do hereby certify and return that the transcript of the record filed with the application to the Supreme Court of the United States for a writ of certiorari in the case of Alva L. Kitselman and Davis M. Kitselman, copartners as Kitselman Bros., appellants, *vs.* Kokomo Fence Machine Company, Jesse H. Srofe, Harry Ward, John E. Frederick, Kitty Srofe, George W. Frederick and Joel Ward, appellees, is a full, true and complete transcript of the record upon which said case was heard in the United States circuit court of appeals for the seventh circuit, together with all proceedings in said court.

In testimony whereof, I hereunto subscribe my name and affix the seal of said United States circuit court of appeals for the seventh circuit, at the city of Chicago, this sixteenth day of November, A. D. one thousand nine hundred and one.

Seal United States Circuit Court of Appeals, Seventh Circuit.

EDWARD M. HOLLOWAY,
Clerk of the United States Circuit Court of Appeals for the Seventh Circuit.

860 [Endorsed:] File No. 18,242. Supreme Court U. S. October term, 1901. Term No. 389. Kokomo Fence Machine Co., petitioner, *vs.* Alva L. Kitselman *et al.* Writ of certiorari and return. Filed Dec. 9", 1901.

861 Supreme Court of the United States, October Term, 1901.

KOKOMO FENCE MACHINE COMPANY, Petitioner,
vs.
ALVA L. KITSELMAN ET AL. } No. 389.

On petition for a cross-writ of certiorari to the United States circuit court of appeals for the seventh circuit.

On consideration of the petition for a cross-writ of certiorari herein to the United States circuit court of appeals for the seventh circuit, and of the argument of counsel thereupon had, as well in support of as against the same, it is now here ordered by the court that said petition be, and the same is hereby, granted March 17, 1902.

862 [Endorsed:] File No. 18242. Supreme Court of the United States. Term No. 389 October term, 1901. Order on petition for cross-writ of certiorari. Filed Mar. 17, 1902.